TECHNICAL MEMORANDUM

FOR

SUPPLEMENTAL EVALUATIONS

AT
FORMER DETROIT COKE SITE
DETROIT, MICHIGAN

PREPARED FOR
MICHIGAN DEPARTMENT OF
ENVIRONMENTAL QUALITY
ENVIRONMENTAL RESPONSE DIVISION

APRIL 1999

PREPARED BY
MALCOLM PIRNIE ENGINEERS, LLP
1400 ABBOTT ROAD, SUITE 140
EAST LANSING, MICHIGAN 48823

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MALCOLM PIRNIE

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MALCOLM PIRNIE

1.0. INTRODUCTION

1.1 LOCATION AND SITE BACKGROUND

The Former Detroit Coke Corporation Site (7819 Jefferson Ave., in Detroit, Michigan, Wayne County, Section 27, T2S, R11E) is located near the intersection of the Rouge and Detroit Rivers (Figure 1-1). The approximate site boundaries are as follows:

- Detroit River to the south.
- Rouge River to the southwest.
- Zug Island Road to the west.
- Yellow Trucking Company property to the north.
- Detroit Edison property to the northeast.

Allied Chemical Corporation began operations at the site about 1910 when two coke ovens were constructed. An additional coke oven battery was constructed on site prior to 1968. The first three coke oven batteries were demolished and a fourth was built between 1968 and 1980. In 1980 Detroit Coke began operations at the site and operated until late 1991. In 1991 the facility was closed, and the majority of the facility structures were subsequently demolished. Demolition of some of the last remaining structures continued through March 1998.

Around 1991, several bulk storage and reprocessing businesses began operation on the western and southern portions of the site. Present day operations include a truck ferrying business (Detroit-Windsor Truck Ferry), an electric contracting firm (Transtech), and stock piling and reprocessing of materials such as coal, cinders, rocksalt, blast furnace slag, building debris, and river dredging spoils (MARBI, Hickman Williams Co., and others). The Michigan Department of Environmental Quality (MDEQ), the City of Detroit, and the U.S. Environmental Protection Agency (USEPA) are currently in the process of establishing property ownership status and identifying potentially responsible parties.

Preliminary site evaluations were performed by Malcolm Pirnie on behalf of MDEQ in February and March 1998, in an attempt to assess the presence and magnitude of regulated organic and inorganic compounds in the soil and/or shallow groundwater at the site. The

following tasks were performed during the preliminary site evaluations completed in 1998:

- Sampling of surface and subsurface soil and analysis for compounds of concern.
- Installation of groundwater monitoring wells and collection and analysis of groundwater samples.
- Preparation of an aerial and topographic survey of the site, including the locations of sampling points and other key site features.
- Recording of groundwater levels to provide preliminary information on the hydraulic characteristics of saturated zones at the site.

The findings of these site evaluations were summarized and presented in a Technical Memorandum (Malcolm Pirnie; Site Evaluations Technical Memorandum; May 1998), therefore, they are not repeated here.

1.2 OBJECTIVES

Based on the findings of the preliminary site evaluations performed in 1998, a Supplemental Site Evaluation Work Plan (February 1999) was developed to provide additional site data. The information compiled during the Supplemental Site Evaluation will be used to assist various parties in determining necessary remedial actions prior to proceeding with redevelopment/reuse plans.

The general objectives stated in the Supplemental Site Evaluation Work Plan were:

A. **Clay Unit Characterization.** Evaluation of the extent, thickness, and physical/chemical characteristics of the clay units, as related to their influence on the distribution and migration of tarry/oily wastes and contaminated groundwater previously observed at the site, and their suitability for implementing potential remedial technologies.

B. **Groundwater Characterization.** Evaluation of the presence and migration of contaminated groundwater at the site, and its potential impact on the surface water

adjacent to the site (mixing zone determination) and on the Groundwater-Surface Water Interface (GSI).

C. **Product Characterization**. Characterization of tarry/oily material present in the site soils and/or in a "free flowing product" form.

2.0 FIELD INVESTIGATION

The Supplemental Site Evaluation work was performed between February 10 and March 10, 1999. The field activities were performed according to the procedures presented in the Detroit Coke Supplemental Site Evaluations Work Plan, dated February 31, 1999. Malcolm Pirnie personnel supervised all on-site activities. The following tasks were completed:

- Soil Boring Installation.
- Groundwater Characterization including;
  - ◊ Vertical Aquifer Sampling.
  - ◊ Monitoring well installation.
  - ◊ Groundwater and surface water sampling.
- Test Pit Installation/Evaluation.

Field activities and methodologies for performing these tasks are presented in the following subsections.

2.1. SOIL BORING AND TESTING

Stearns Drilling of Dutton, Michigan was retained to install soil borings and monitoring wells at the site. A Malcolm Pirnie hydrogeologist supervised drilling activities and logged each soil boring. The soil borings were advanced along five north-south oriented transects between February 11 and 26, 1999. Prior to the commencement of drilling activities, the five transects and soil boring locations were surveyed and staked by Wade-Trim Associates (Wade-Trim) based on the established site grid. Following installation of the soil borings, the locations were verified and surface elevations were surveyed by Wade-Trim. The soil boring locations and transects are shown on Figure 2-1.

Initially, 25 "shallow" soil borings (SB-301 through SB-324, and MW-202S) were drilled using 4.25-inch I.D. hollow stem augers (HSA). The "shallow" borings were terminated into the upper clay or upper sand unit. Borings SB-B320, MW-202D and SB-E318, which were advanced at locations where the upper clay unit was absent, were terminated into the lower clay unit.

In addition to the drilling of the "shallow" borings, seven "deep" borings (SB-A302-D, SB-B303-D, SB-B306-D, SB-C319-D, SB-D312-D, SB-D314-D, and SB-E321-D) were advanced to further define the thickness of the upper clay unit and the subsurface conditions below the upper clay unit. The "deep" borings were drilled at locations adjacent to the corresponding "shallow" borings. Initially, 12.25-inch diameter HSAs were advanced 1 to 4 feet into the upper clay unit. Ten-inch diameter steel casing was then installed inside the HSA and was "pushed" with the drill rig approximately 0.5 to 1 foot into the clay to ensure a tight seal. The annular space between the borehole wall and the casing was then further sealed with bentonite-cement. The bentonite-cement was allowed to cure for a minimum of 24 hours. The "deep" boring was then advanced through the 10-inch casing with 4.25-inch HSA.

Soil samples were collected from each boring using split-spoon samplers. Each soil sample was logged by a Malcolm Pirnie hydrogeologist using USCS classifications. The hydrogeologist also noted the soil's texture, color, moisture content, odor, the presence or absence of staining and free-phase product, and other pertinent information. The soil samples were field screened for the presence of total volatile organic vapors with a photoionization detector (PID) equipped with a 10.7 eV lamp. Since there was available data on the upper soils at the site, soil samples were typically not collected from the upper eight feet of each boring although the soil cuttings from the upper intervals were logged by the on-site hydrogeologist. Split-spoon samples were then collected continuously in the "shallow" borings until the upper clay and/or the upper sand was encountered. Typically, split-spoon samples were collected in five foot intervals at depths of greater than 20 feet below grade level (bgl) in the "deep" borings and in the "shallow" borings installed outside the limits of the upper clay. Where deemed necessary by the on-site hydrogeologist, split-spoon samples were collected more frequently in order to further define the stratigraphy. Soil boring and monitoring well construction logs are included in Appendix A.

Soil samples of the upper clay material were collected with Shelby tubes at "deep" boring locations SB-A302-D (11.5-14' bgl), SB-B303-D (10-12.5' bgl), SB-B306-D (9.5-12' bgl), and SB-D312-D (15-17' and 17-19' bgl). Shelby tube samples were also attempted at boring locations SB-C319-D and SB-E314-D; however, samples could not be recovered at these locations. The Shelby tube samples were submitted to the STS Consultants LTD, (STS)

Geotechnical Laboratory located in Lansing, Michigan for permeability testing and grain size analyses.

One soil sample from each "shallow" boring SB-A301 through SB-E321 was labeled, packed on ice in a shipping cooler, and submitted to ENCOTEC Laboratory of Ann Arbor, Michigan for analysis. Typically, soil samples submitted for laboratory analysis were collected from the interval immediately above the top of the upper clay unit. However, at some locations soil samples were collected and submitted for laboratory analysis based on elevated PID readings, and/or the presence of product or visible staining. The soil samples were analyzed for the following parameters:

- Ammonia.
- Cyanide (CN).
- Michigan 10 Metals (As, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag, and Zn).
- Volatile Organic Compounds (VOCs) by USEPA Method 8260 analyses for the compounds on the MDEQ 8260 plus (Encore Samplers).
- Base Neutral Compounds (BNs) by USEPA Method 8270.

Temporary wells were installed in borings SB-B320, SB-E318, SB-E323, and MW-202D, which are located outside the upper clay unit, and in "deep" borings SB-A302-D, SB-B306-D, SB-C319-D, SB-D314-D, and SB-E321-D, which are located in areas where the upper clay unit is present. Vertical Aquifer Sampling (VAS) was then performed at these temporary well locations. Following receipt and review of the VAS analytical results, monitoring wells were completed in borings SB-B306-D, SB-B320, SB-C319-D, SB-E321-D, and SB-202-D. Shallow water table wells were also installed in borings MW-201, MW-202S and MW-203. Groundwater characterization methodologies are discussed in more detail in Section 2.2.

Soil borings which were not converted into temporary wells or permanent monitoring wells were abandoned soon after completion. The boreholes were tremie grouted with bentonite slurry from the bottom of the borehole up to ground level. Temporary wells which were not converted into permanent monitoring wells were also grouted with bentonite slurry and abandoned. Labeled wooden or metal stakes were installed to identify each boring location. During the week of March 1, 1999, the surface elevations and grid locations of the borings were

surveyed by Wade-Trim and the site maps were updated.

All downhole drilling equipment was decontaminated between borings with a steam cleaner. Split-spoon samplers were decontaminated between uses in a TSP wash and water rinse, and steam cleaned if appropriate. Drill cuttings and decontamination fluids were containerized in labeled 55-gallon drums that were staged in a central location at the site. The drum contents will be sampled, analyzed, and will be properly disposed off-site.

2.2 GROUNDWATER CHARACTERIZATION

The objective of the groundwater characterization performed during the Supplemental Evaluation was to obtain data to be used by the State and other parties in addressing the following issues:

- Evaluation of the current status of groundwater contamination at the site.
- Evaluation of the presence and nature of groundwater contamination at the "edge" of the clay unit , as well as in the deeper sand zone below the clay.
- Evaluation of water level fluctuations in the saturated zones, as they may impact the leaching of compounds of concern from the soils into the saturated zones.
- Evaluation of the impact of contaminated groundwater in the groundwater-surface water interface zones of the Detroit and Rouge Rivers.
- Assessment of the chemical characteristics and migration of the groundwater at the site.

The groundwater characterization consisted of the following three main tasks:

- Installation of temporary wells.
- Installation of permanent monitoring wells.
- Collection and analysis of a full round of groundwater level measurements and groundwater samples from all on-site wells.

2.2.1 Temporary Wells

Nine temporary wells were installed and sampled during February 1999. The temporary wells were located along each transect based on the presence or absence of the upper clay unit in the borings.

The temporary wells were constructed of a five foot length of 2-inch diameter stainless steel screen (0.007-inch slot size) and 2-inch diameter galvanized steel riser pipe, except for SB-E321. A five-foot long, 2-inch diameter Polyvinyl chloride (PVC) screen (0.010-inch slot size) and 2-inch diameter PVC riser were used in SB-E321 because the collapsed soft material below the target depth would not have supported the weight of a steel screen and casing.

The temporary wells were allowed to stabilize for at least 24 hours after installation prior to VAS. Prior to sampling at each interval, the temporary wells were developed by over-pumping until the evacuated groundwater was visibly clear. At intervals completed in low producing saturated zones, the temporary wells were developed with disposable polyethylene bailers. Groundwater samples were collected and transferred from disposable polyethylene bailers into labeled, pre-preserved 40 milliliter (ml) septum vials that were placed on ice in shipping coolers. Following sampling of the deepest interval, the temporary well was pulled up to the next sampling interval and the development and sampling process was repeated.

The groundwater samples were submitted to the MDEQ Environmental Laboratory in Lansing, Michigan for VOC analyses for the compounds on the MDEQ 8260+ list. The samples were analyzed with a 24-hour turn-around time. The expedited laboratory data were then used to determine which borings and/or intervals would be converted into permanent monitoring wells.

Temporary wells were installed in the following borings:

Transect A	**Stratigraphic Location**	**VAS Intervals**
SB-A302-D	Below upper clay	15-20 feet bgl
Transect B		
SB-B320	Outside upper clay	12-17 and 19-24 feet bgl
SB-B306-D	Below upper clay	12-17 and 19-24 feet bgl
Transect C		
SB-C319-D	Outside upper clay	20-25, 30-35, and 42-47 feet bgl

Transect D

MW-202-D	Outside upper clay	15-20 feet bgl
SB-D314-D	Below upper clay	15-20, and 30-35 feet bgl

Transect E

SB-E318	Outside upper clay	7-12, 19-24, and 30-35 feet bgl
SB-E323	At edge of clay	10-15 feet bgl (fill)
SB-E-321-D	Below upper clay	19-24 feet bgl

2.2.2 Permanent Wells

Eight permanent monitoring wells were installed during the Supplemental Evaluation. The well locations and screen intervals were selected based on the VAS results, geologic data collected during soil boring installation, and/or in areas where there were gaps in groundwater quality data and groundwater level data.

Shallow monitoring wells MW-201, MW-202S, and MW-203 were installed to intersect the water table at locations near the boundary of the site. Monitoring wells MW-320 (SB-B320) and MW-202D were installed at locations just outside the "edge" of the upper clay unit in order to assess potential contaminant migration from the upper saturated fill zone. Double cased "deep" monitoring wells MW-306D, MW-319D and MW-321 were installed to provide groundwater quality data on the sand zone present directly below the upper clay unit. Monitoring well locations are shown on Figure 2-1.

Shallow monitoring wells MW-201, MW-202S, MW-203 and MW-321 were constructed with five-foot long, 2-inch diameter PVC screen (0.010-inch slot size) and riser. The remaining monitoring wells were constructed with five-foot long, 2-inch diameter stainless steel screen (0.010-inch slot size) and galvanized steel riser. Global #7 silica sand pack was installed around the well screen to a minimum of two feet above the top of the screen. A two foot bentonite seal was installed above the sand pack. The remaining annular space was sealed with either hydrated bentonite chips (shallow wells) or bentonite slurry (deep wells). Each well was completed with a locking four-inch square steel stick-up protector, which was concreted in-place. The wells were developed with a drill rig mounted Moyno pump at various flow rates until the evacuated development water was visibly clear of sediments.

During the week of March 1, 1999, the location and top of casing elevations of the newly constructed wells were surveyed by Wade-Trim.

2.2.3. Groundwater/Surface Water Sampling

Groundwater samples were collected during the week of March 5, 1999, from eight newly installed monitoring wells, 22 previously installed monitoring wells, and from 13 existing (pre-1998) monitoring wells on site. Surface water samples were also collected in the vicinity of the three staff gages located in the Detroit River, Rouge River and at the confluence of the Detroit and Rouge Rivers.

The groundwater and surface water samples were collected and submitted to the MDEQ laboratory or ENCOTEC Laboratory of Ann Arbor, Michigan. The samples were analyzed for the following:

- Ammonia (ENCOTEC Laboratory).
- Cyanide (ENCOTEC Laboratory).
- Dissolved Michigan Ten Metals (ENCOTEC Laboratory).
- Total Michigan 10 metals (ENCOTEC Laboratory) for "low flow" samples only.
- VOCs by USEPA Method 8260 analyses for the compounds on the MDEQ 8260 plus list (MDEQ Laboratory).
- BNs by USEPA Method 8270 (ENCOTEC Laboratory).

Samples were collected and handled in accordance with the procedures described in the Supplemental Site Evaluations Work Plan (February 1999). Samples were submitted to the laboratories under chain of custody documentation. The groundwater and surface water samples were obtained with disposable bailers to eliminate the potential for cross contamination. The following groundwater samples from monitoring wells bordering the Detroit and Rouge Rivers were obtained by the "low flow" sampling protocol (Malcolm Pirnie, 1999): P-3S, MW-105, MW-106, MW-107S, MW-109, MW-113S, MW-202S, and MW-202D.

Samples were collected following purging of at least three well casing volumes of water from each well, or recharge of wells that were bailed dry. Where low flow sampling was

performed, samples were collected following three stabilized readings of pH, temperature, and specific conductance. Samples collected for dissolved metals analysis were filtered in the field with in-line filters prior to preservation.

2.3 TEST PITS AND PRODUCT EVALUATION

Fifteen test pits were excavated at locations across the site (Figure 2-1). The objectives for test pit excavation were to observe:

- the distribution of tarry/oily material present as "free flowing" product at the water table and/or in the saturated zone, and/or bound in the unsaturated soil matrix.
- the migration pattern of the "free flowing" component of tarry/oily product.
- the chemical and physical characteristics of the tarry/oily material present in the soils and/or as "free flowing" product.

Approximately 10 of the 15 test pits were excavated to provide a visual confirmation of subsurface conditions at locations where product was observed during the site evaluation work performed in February and March 1998. Approximately five test pits were located in downgradient positions from the ten test pits to evaluate the extent of product migration. Prior to test pit excavation, the proposed test pit locations were surveyed and staked by Wade-Trim.

The test pits were excavated by Youngs Environmental Cleanup (Youngs) on February 16 to February 18, 1999. The test pits were excavated using a backhoe to depths ranging from 7 to 14 feet bgl. An average of ten cubic yards of soil and/or fill material were excavated at each test pit location and stockpiled adjacent to each test pit. The excavated material was placed on a diked plastic liner and covered with a second liner to prevent the generation and runoff of leachate.

Soil samples were collected from each soil horizon and logged. The soil's texture, color, moisture content, odor, the presence or absence of staining and free-phase product, and other pertinent information was recorded. The soil samples were field screened for the presence of total volatile organic vapors with a PID equipped with a 10.7 eV lamp. Test pit depth, PID readings, and descriptions of the fill material were recorded on logs for each test pit and are

presented in Appendix B.

Samples of the fill material excavated from ten of the test pits were collected and submitted to ENCOTEC for the following analyses:

- Ammonia.
- Cyanide.
- Michigan Ten Metals.
- VOCs.
- BNs.

The test pit soil samples were also subjected to the Synthetic Precipitation Leaching Procedure (SPLP) according to USEPA Method 1312. The SPLP testing was conducted to determine if chemicals present in the fill material were susceptible to leaching into the site groundwater under normal conditions. The SPLP extract (leachate) was analyzed for the following parameters:

- Ammonia.
- Michigan Ten Metals.
- BNs.

Liquid that infiltrated into the 15 test pits was pumped three times during the evaluation period to investigate the presence of free-phase product in the test pits and to evaluate the potential for free-phase product to move through site fill material into the test pits. The test pit water was pumped on February 25, March 5, and March 10, 1999. The observations for test pit pumping events (depth to liquid, quantity pumped, presence or absence of floating or sinking product and presence or absence of a sheen) were recorded and are presented in Appendix C.

Liquid samples were collected on February 25, 1999, from four test pits observed to contain free-phase product, or colored liquids believed to be or contain product. The samples were submitted to ENCOTEC and were analyzed for the following:

- Ammonia.
- Cyanide.

- Michigan Ten Metals.
- VOCs.
- BNs.

3.0 RESULTS

3.1 SOIL BORINGS

3.1.1 Soil Stratigraphy

The surficial material encountered at the site consist primarily of black medium sand and other fill material including mixtures of rocks, bricks, cinders, coal, and blast furnace slag. The fill material is underlain in some locations by medium-to-fine grained sand. An upper clay unit is present beneath the upper fill and/or sand across much of the site. Soil boring logs are presented in Appendix A.

Based on the information obtained from the soil borings and monitoring well boreholes, eight stratigraphic cross-sections have been prepared and are presented on Figures 3-1 and 3-2. The cross-sections show that the fill material varies from 2 to 23 feet in thickness. In general, the fill is underlain by 0 to 5 feet of poorly sorted sand at the north portion of the site. A low-plasticity, gray clay unit is present below this sand to the north, and beneath the fill where and is not present. The clay unit has some interbeds of silt and sand near the Detroit and Rouge Rivers. These interbeds, possibly old stream channel deposits, increase in thickness, and frequency of occurrence towards the rivers. Most of the interbeds are only a few feet thick, but one is as thick as 39 feet near the confluence of the rivers and may extend as far as 2,000 feet north into the gray clay as shown on cross-sections C-C' and D-D' on Figure 3-1. The upper surface of this gray clay appears to be continuous (interbedding occurs at depth) over most of the site, but terminates between 0 and 200 feet from the rivers. Additionally, a white, pasty high pH deposit (possibly fill material) is present at several locations at the site at variable depths (5 to 10 feet bgl).

3.1.2 Soil Analytical Results

ENCOTEC Laboratory of Ann Arbor, Michigan analyzed all soil samples for the following:

- Ammonia.
- Cyanide.
- Michigan Ten Metals.

- VOCs by USEPA Method 8260 for the compounds on the MDEQ 8260+ list.
- Base Neutral Compounds (BNs) by USEPA Method 8270.

All samples were delivered to the laboratory under chain of custody documentation. Analytical results are summarized in Tables 1 through 3. Results were compared to the potentially applicable cleanup criteria presented in Table 4.

Ammonia

Analytical data for ammonia are presented in Table 1. All 19 soil samples contained ammonia concentrations exceeding the Groundwater-Surface Water Interface Protection Criterion (GSI), except at location SB-C320. None of the soil samples analyzed contained ammonia concentrations exceeding the Industrial Direct Contact (IDC) Criterion or Soil Volatilization to Indoor Air Inhalation Criterion (SVIIC).

Compound	Samples		
Ammonia	SB-A301	SB-C309	SB-E318
	SB-A302	SB-C310	SB-C319
	SB-B303	SB-D311	SB-C320
	SB-B304	SB-D312	
	SB-B305	SB-E314	
	SB-B306	SB-E315	
	SB-B307	SB-E316	
	SB-C308	SB-E317	

Cyanide

Analytical data for cyanide are presented in Table 1. The following nine soil samples contained cyanide concentrations that exceed the GSI Criterion:

Compound	Samples		
Cyanide	SB-B305	SB-D311	SB-E316
	SB-B307	SB-D313	SB-E318
	SB-C309	SB-E314	SB-C319

None of the soil samples analyzed had reported cyanide concentrations exceeding the IDC Criterion or SVIIC.

Michigan Ten Metals

Analytical data for Michigan Ten Metals are presented in Table 1. The following 12 soil samples contained concentrations of one or more of the following metals GSI.

Metals	Samples	
Arsenic	SB-A301	SB-E318
Barium	SB-C308	SB-C319
Cadmium	SB-C309	SB-C320
Chromium	SB-D312	
Copper	SB-D313	
Lead	**SB-E314**	
Mercury	SB-E315	
Selenium	SB-E316	
Zinc	SB-E317	

One soil sample, SB-E314, contained arsenic at a concentration of 400,000 ug/kg which exceeds the IDC Criterion. None of the soil samples analyzed contained Michigan Ten Metals concentrations exceeding the SVIIC.

VOCs

Analytical data for VOCs are presented in Table 2. The following ten soil samples contained at least one of the following VOC compounds at concentrations exceeding GSI.

VOCs	Samples		
Naphthalene	SB-B304	SB-D312	SB-E316
Benzene	SB-C309	SB-D313	SB-E318
	SB-C310	**SB-E314**	SB-C319
	SB-D-311		

One sample (SB-E314) contained benzene at a concentration of 22,000 ug/kg which exceeds the SVIIC of 8,400 ug/kg. None of the soil samples analyzed contained VOC concentrations exceeding the IDC Criteria.

However, elevated detection limits resulting from a high naphthalene concentration in the sample from SB-D311 make comparison of several VOC compounds (benzene, carbon disulfide, toluene, trimethyl benzenes and tetrachloroethene) to SVIIC and IDC Criteria impossible.

BNs

Analytical results for BNs are summarized and presented in Table 3. The following 11 soil samples contained at least one of the following BN compounds in concentrations exceeding GSI:

BN compounds	Samples		
Acenaphthene	SB-A302	SB-D311	SB-E316
Fluorene	SB-B304	SB-D312	SB-E318
Naphthalene	SB-C308	SB-D313	SB-C319
Phenanthrene	SB-C309	SB-E315	

None of the soil samples analyzed contained BN compound concentrations exceeding the IDC Criteria or SVIIC.

3.2 GROUNDWATER

3.2.1. Site Hydrogeology

Groundwater elevations were determined by measuring the depth to water below the monitoring well top of casing (TOC) using an electronic water level and free product indicator. Depth to water measurements were then subtracted from the surveyed TOC elevations to obtain groundwater elevations. Water elevation measurements obtained on March 1, 1999 are shown in Table 5.

A groundwater potentiometric surface map, that includes groundwater elevations for wells completed in the fill material, is presented on Figure 3-3. Review of the groundwater potentiometric surface map (Figure 3-3) shows that groundwater flows from the north in a southern-southeastern direction towards the Rouge and Detroit Rivers. The hydraulic gradient is not uniform across the site. The potentiometric surface has three distinct areas based on their hydraulic gradients:

- The north central portion of the site, where the gradient is relatively flat.
- The central region of the site, where the gradient is steep.
- The southern third of the site, where the gradient is relatively flat.

Irregular groundwater contours in the north-central area of the site are evident on the potentiometric surface map, but are attributed to a reported broken City of Detroit water line that flooded most of this area prior to measuring groundwater levels. These irregular contours are the result of preferential recharge of water which flooded the ground surface and infiltrated into permeable areas such as gaps between foundations or unpaved areas. The steep gradient in the north-central portion of the site, and the flatter gradient in the southern portion of the site are similar to the gradients observed previously (May 1998). Because these features are similar to historical features, they are not attributed to the broken water line. The relatively flat gradient in the southern third of the site indicates that the mixing zone for the Detroit River extends over the southern third of the site.

3.2.2 Groundwater Sampling Results

Vertical Aquifer Sampling

All temporary wells were sampled for VOCs. Samples were analyzed by the MDEQ laboratory. The analytical results are summarized in Table 6. These results were used to determine placement of permanent wells.

Visual Observations

Dense Non-Aqueous Phase Liquid (DNAPL) was observed at the bottom of the screened intervals in three monitoring wells prior to purging. MW-101, MW-102, and P-6D each contained approximately ten inches of DNAPL in the bailers when bailing began at each location. Several photographs were taken of this substance (Appendix D). A similar looking black substance was also observed in MW-117 after bailing approximately one well volume. Because the black substance entered the well during purging, its thickness could not be measured.

Analytical Results

ENCOTEC analyzed all groundwater samples except VOCs which were analyzed by the MDEQ laboratory. Groundwater samples were analyzed for the following:

- Ammonia.
- Cyanide.
- Michigan Ten Metals.
- VOCs.
- BNs.

All samples were delivered to the laboratories under chain of custody documentation. Analytical results are summarized in Tables 7 through 10. Results were compared to the potentially applicable cleanup criteria presented in Table 20. Cyanide and ammonia concentrations in groundwater samples are shown on Figure 3-4. Benzene and naphthalene concentrations in groundwater samples are shown on Figure 3-5.

Ammonia

Analytical data for ammonia in groundwater samples are presented in Table 7. The following 39 samples contained ammonia concentrations that exceed the GSI Criterion:

Compound	Samples			
Ammonia	MW-1	MW-3	MW-4	MW-100
	MW-101	MW-102	MW-103	MW-104
	MW-105	MW-106	MW-107S	MW-109
	MW-110	MW-111	MW-112S	MW-112D
	MW-113S	MW-114	MW-115	MW-117
	MW-118	MW-119D	MW-120	MW-121
	MW-202S	MW-202D	MW-203	MW-306D
	MW-319D	MW-320	MW-321	P-1S
	P-2S	P-3S	P4S	P-4D
	P-5S	P-5D	P-6D	

None of the groundwater samples analyzed contained ammonia concentrations that exceed the Groundwater Contact Criteria (GCC) or Groundwater Volatilization to Indoor Air Criteria (GVIC).

Cyanide

Analytical data for cyanide are presented in Table 7. The following 36 groundwater samples contained cyanide concentrations that exceed the GSI Criterion:

Compound	Samples			
Cyanide	MW-1	MW-3	MW-4	MW-100
	MW-102	MW-103	MW-104	MW-105
	MW-106	MW-107S	MW-109	MW-111
	MW-112S	MW-112D	MW-113S	MW-115
	MW-116	MW-117	MW-118	MW-119D
	MW-120	MW-121	MW-201	MW-202D
	MW-203	MW-319D	MW-320	MW-321
	P-1S	P-2S	P-3S	P4S
	P-4D	P-5S	P-5D	P-6D

None of the groundwater samples analyzed contained cyanide concentrations that exceed the GCC or GVIC.

pH

Field measurements of pH in groundwater samples are presented in Table 7. High pH values were recorded at several locations, as high as 13.5.

Michigan Ten Metals (dissolved)

Analytical data for dissolved Michigan Ten Metals in groundwater samples are presented in Table 7. The following 21 samples contained concentrations of one or more of the following metals that exceed GSI Criteria:

Dissolved Metals	Samples		
Barium	MW-3	MW-101	MW-107S
Mercury	MW-109	MW-111	MW-112D
Selenium	MW-113S	MW-119D	MW-120
Silver	MW-201	MW-202D	MW-203
	MW-306D	MW-320	MW-321
	P-1S	P-2S	P-3S
	P-4D	P-5D	P-6D

None of the groundwater samples contained Michigan Ten Metals concentrations that exceed the GCC or GVIC.

Michigan Ten Metals (total)

Analytical data for total Michigan Ten Metals in groundwater samples are presented in Table 8. Seven of the eight samples collected contained concentrations of one or more of the following metals that exceed GSI Criteria:

Total Metals	Samples	
Barium	MW-106	MW-202S
Mercury	MW-107S	MW-202D
Selenium	MW-109	P-3S
Silver	MW-113S	

None of the low flow samples contained total metals concentrations that exceed the GCC or GVIC.

VOCs

Analytical groundwater data for VOCs are presented in Table 9. The following 14 groundwater samples had at least one of the following reported VOC concentrations that exceed the GSI Criteria:

VOCs	Samples	
Benzene	MW-3	MW-101
Toluene	MW-102	MW-103
Ethylbenzene	MW-111	MW-117
Xylenes	MW-118	MW-120
Naphthalene	MW-121	MW-306D
Styrene	P-3S	P-4S
	P-5D	P-6D

None of the groundwater samples contained VOC concentrations that exceed the GCC or GVIC. Figure 3-5 shows the sample locations where the concentrations of benzene and naphthalene exceeded the GSI Criteria.

BNs

Analytical results for BNs in groundwater samples are summarized and presented in Table 10. The following ten groundwater samples contained at least one of the following reported BN compounds in concentrations that exceed GSI Criteria:

BN Compounds	Samples	
Acenaphthene	**MW-101**	MW-118
Fluorene	**MW-102**	MW-306D
Naphthalene	MW-103	P-3S
Phenanthrene	MW-111	P-4S
Pyrene	MW-117	**P-6D**

The three samples shown above in bold contained one or more of the following compounds at concentrations that exceed GCC and GVIC:

BN Compounds concentration exceed GCC	BN compounds concentration exceed GVIC
Acenaphthene	Acenaphthene
Acenaphthylene	Acenaphthylene
Fluoranthene	Anthracene
Fluorene	Fluoranthene
Phenanthrene	Fluorene
Pyrene	Phenanthrene
	Pyrene

3.2.3 Surface Water Sampling Results

None of the surface water samples contained compounds of concern at concentrations which exceed GSI, GCC, or GVIC.

3.3. TEST PITS AND PRODUCT EVALUATION

3.3.1. Test Pit Soil Observations

The surficial material encountered at the test pit locations consists of topsoil, cinders, demolition debris, refractory brick, slag, white pasty and granular ("oolitic") material, coal tar, silt, clay, and gravel. The fill material was underlain in some locations by fine grained sand or silt. The upper clay unit was observed beneath the upper fill and/or sand at many test pit locations.

Two test pits, Test Pit 6 and Test Pit 12, were relocated from their planned locations. When excavating Test Pit 6, water rushed into the excavation presumably from the adjacent tar tank secondary containment area. The water leak was plugged and Test Pit 6 was relocated to the north of the tar tank containment area. The excavation in the original location of Test Pit 12 revealed two horizontal concrete slabs. The upper slab was located approximately one foot bgl and the second slab was located approximately five feet bgl. The interval between the slabs was

backfilled with clean sand. The decision was made to not breach the lower concrete slab and the test pit was relocated approximately 140 feet to the north east. Following completion of the test pits, Wade-Trim re-surveyed the locations and elevation of Test Pits 6 and 12.

The fill material at many test pit locations was impacted with petroleum products. Free-flowing product was observed at Test Pits 1, 5, and 9. Tarry material (product) was also observed in the soil and fill material matrix at Test Pits 1, 5, 7, 8, 9, 11, 13 and 14. Elevated PID readings were measured for fill material removed from Test Pits 1, 5, 7, 8, 9, 11, 13 and 14. A description of the fill material and PID measurements for each test pit are presented in Appendix B.

A viscous, reddish-black tar-like free flowing material was observed seeping into Test Pit 1 through the sidewall. At Test Pit 5, a black tar-like free flowing material was also observed seeping through the test pit sidewall. A greenish-yellow fluid was observed seeping into the sidewall in Test Pit 9. At Test Pit 5, a red fluid having a strong burnt oil odor was noted. The highest PID reading of 224 parts-per-million (ppm) was recorded at Test Pit 9 from the 5' - 7' bgl interval which consisted of cinders, slag, and concrete rubble.

3.3.2. Test Pit Soil Analytical Results

Samples of fill material from ten test pits were submitted to ENCOTEC. The samples collected from Test Pits 1, 3, 4, 5, 7, 8, 9, 11, 13, and 14 were analyzed for the following parameters:

- Ammonia.
- Cyanide.
- Michigan Ten Metals.
- VOCs.
- BNs.

All samples were delivered to the laboratory under chain of custody documentation. Analytical results are summarized in Tables 11 through 13. All analytical results were compared to the potentially applicable cleanup criteria presented in Table 4.

Ammonia

Analytical results for ammonia are presented in Table 11. The highest reported ammonia concentration was 300,000 ug/kg for the sample collected from Test Pit 7. The following six test pit soil samples contained ammonia concentrations exceeding the GSI Criterion:

Compound	Samples	
Ammonia	Test Pit-5	Test Pit -9
	Test Pit -7	Test Pit -13
	Test Pit -8	Test Pit -14

Cyanide

Analytical data for cyanide are presented in Table 11. The highest cyanide concentration reported was 190,000 ug/kg for the soil sample collected from Test Pit 9. The following six soil samples contain cyanide concentrations that exceed the GSI Criterion:

Compound	Samples	
Cyanide	Test Pit-5	Test Pit -11
	Test Pit -8	Test Pit -13
	Test Pit -9	Test Pit -14

None of the soil samples analyzed contained cyanide concentrations exceeding the IDC Criterion.

Michigan Ten Metals

Analytical data for Michigan Ten Metals are presented in Table 11. All ten test pit soil samples contained concentrations of one or more of the following metals exceeding the GSI Criteria:

Metals		Samples	
Arsenic	Lead	Test Pit -1	Test Pit -8
Cadmium	Mercury	Test Pit -3	Test Pit -9
Chromium	Selenium	Test Pit -4	Test Pit -11
Copper	Zinc	Test Pit -5	Test Pit -13
		Test Pit -7	Test Pit -14

None of the soil samples analyzed contained Michigan Ten Metals concentrations that exceed the IDC Criteria.

VOCs

Analytical results for VOCs are presented in Table 12. The following ten soil samples contained at least one of the following VOCs at concentrations exceeding GSI Criteria:

VOCs	Samples	
Benzene	Test Pit -1	Test Pit -8
Naphthalene	Test Pit -3	Test Pit -9
Total Xylenes	Test Pit -4	Test Pit -11
Vinyl Chloride	Test Pit -5	Test Pit -13
	Test Pit -7	Test Pit -14

The soil sample from Test Pit 9 contained benzene at a concentration of 100,000 ug/kg which exceeds the SVIAC Criterion of 8,400 ug/kg. The soil sample from Test Pit 5 contained naphthalene at a concentration of 9,000,000 ug/kg which exceeds the GSI Criterion but is less than the SVIAC and the IDDC. No soil samples analyzed contained VOC concentrations

exceeding the IDC Criteria.

Figure 3-5 presents the locations where benzene and naphthalene concentrations exceed the Criteria.

BNs

Analytical results for BNs are summarized and presented in Table 13. The following ten soil samples contained at least one of the following reported BN compounds in concentrations exceeding GSI Criteria:

BNA	Samples	
Acenaphthene	Test Pit -1	Test Pit -8
Fluorene	Test Pit -3	Test Pit -9
Naphthalene	Test Pit -4	Test Pit -11
Phenanthrene	Test Pit -5	Test Pit -13
	Test Pit -7	Test Pit -14

None of the soil samples analyzed contained BN compounds at concentrations exceeding the SVIIC or IDC Criteria.

3.3.3 RCRA Parameters Analytical Results

Soil samples collected from the ten test pits sampled were tested to evaluate whether the excavated material is a characteristic hazardous waste. The samples were submitted to ENCOTEC and analyzed for the following Resource Conservation and Recovery Act (RCRA) parameters:

- Reactive Cyanide.
- Flashpoint.
- pH.
- Reactive Sulfide.

The RCRA parameter test results are reported in Table 11. Review of the test results showed that no samples contained reactive cyanide concentrations above the method detection limit. The flashpoint measured for each of the test pit samples was 200 degrees fahrenheit.

The pH values for the test pit samples ranged from 7.4 to 11.9. The highest pH values of 11.3 and 11.9 were reported for samples from Test Pit 5 and Test Pit 14, respectively.

The results for reactive sulfide ranged from <50 to 6000. The reactive sulfide values exceeded the method detection limit of 50 for Test Pit 5 and Test Pit 9 which measured 650 and 6000, respectively.

3.3.4 Test Pit Soil SPLP Analytical Results

ENCOTEC conducted SPLP testing on soil samples collected from ten test pits. The test pits sampled include Test Pits 1, 3, 4, 5, 7, 8, 9, 11, 13, and 14. The SPLP extract samples were subsequently analyzed for the following parameters:

- Ammonia.
- Michigan Ten Metals.
- BN's.

All samples were delivered to the laboratory under chain of custody documentation. Analytical results are presented in Tables 14 and 15, and all results were compared to the potentially applicable groundwater cleanup criteria summarized in Table 20.

Ammonia

Analytical data for ammonia in SPLP leachate samples are presented in Table 14. The following three samples contained ammonia concentrations that exceed the GSI Criterion:

Compounds	Samples
Ammonia	Test Pit-5 Test Pit-8 Test Pit-14

Michigan Ten Metals

Analytical results for Michigan Ten Metals in the SPLP leachate samples are presented in Table 14. The following three samples contained concentrations of one or more of the following metals that exceed the GSI Criteria:

Metals reported to exceed GSI	Samples with reported GSI exceedance(s)
Selenium	Test Pit-5 Test Pit-7 Test Pit-13

None of the SPLP leachate samples contained Michigan Ten Metals at concentrations that exceed the GCC.

BNs

Analytical results for BNs in the SPLP leachate samples are summarized and presented in Table 15. Six SPLP leachate samples contained at least one of the following BN compounds at concentrations that exceed GSI Criteria:

BN Compounds	Samples	
Acenaphthene	Test Pit-1	Test Pit-13
Fluorene	Test Pit-3	Test Pit-7
Naphthalene	Test Pit-5	Test Pit-9
Phenanthrene		

None of the SPLP leachate samples contained BN concentrations that exceed the GCC or GVIC.

3.3.5 Evaluation of Test Pit SPLP Results

The soil SPLP test results were compared to the test pit soil testing results. The following trends were observed:

- ammonia leached at concentrations that exceed the GSI Criterion from Test Pit 5, 8, and 14 samples. However, ammonia did not leach from the Test Pit 9 and 13 samples.
- the BN compounds acenaphthalene, fluoranthene, fluorene, and phenanthrene were slightly mobilized and transferred into the liquid phase under the SPLP test conditions. Calculations using total BN concentrations in soil and SPLP results showed that these BN compounds leached from 0.5 % to 5 %. Soil from Test Pits 1, 7, and 13 produced leachate having those chemical concentrations that exceed the GSI Criteria.
- the BN compound naphthalene was moderately mobilized into the liquid phase by the SPTP test. Approximately 3 % to 45 % of the naphthalene present in the test pit soil was mobilized into the SPLP extract by the 24-hour SPLP test. On average, 21.7 % of the naphthalene in the soil sample leached into the liquid phase. The resulting naphthalene concentration for five of the ten samples exceeded the GSI Criterion.
- metals were not significantly mobilized in the SPLP test. SPLP extracts for Test Pits 5, 7, and 13 contained selenium concentrations that exceed the GSI Criterion.

The soil SPLP test results were also compared to the groundwater testing results. The following trends were observed:

- comparison of SPLP BN concentrations with groundwater BN levels for wells adjacent to the test pits showed a general order-off-magnitude correlation between the data. Specifically, the soil samples that contained the highest concentrations of BNs (ex. Test Pit 7) produced SPLP leachate having lower concentrations compared with groundwater data.
- the correlation between ammonia in SPLP leachate and groundwater was variable. The soil sample having the highest total ammonia concentration, Test Pit 9, produced SPLP leachate having <50 ug/l. The samples from Test Pit 5, 8, and 14 produced leachate having the same order of magnitude ammonia concentrations as nearby monitoring wells.

3.3.6 Test Pit Pumping Observations

The test pit liquids were pumped on February 25, March 5, and March 10, 1999. The observations for each pumping event were recorded and are presented in Appendix C. The quantity of liquid pumped from the test pits ranged from 5,600 to 8,200 gallons for each pumping event. Test Pits 6 and 7 were not pumped on March 5 and March 10 because they had been filled to the ground surface due to a water main break, and were covered with ice. The water pumped from the pits was transferred from the 3,000 gallon vacuum truck to a 20,000 gallon frac tank located onsite. The liquid surface in many test pits froze or became snow-covered due to weather conditions thus impeding the flow of product and interfering with observations. The containerized liquid will be characterized, transported offsite, and disposed at a licensed waste disposal facility.

Indications of product in water were observed at several test pits. Water having an oil sheen was observed at Test Pits 1, 2, 4, 5, 7, 8, 10, 13, 14, and 15. Black colored water was observed at most locations.

Both floating and sinking product was observed during the three test pit pumping events. Floating product was observed at Test Pit 1, while sinking product was observed at Test Pit 1 and Test Pit 5. A viscous, reddish-black tar-like material was observed seeping into Test Pit 1 through the sidewall. At Test Pit 5, a black tar-like material was also observed seeping through the test pit sidewall. A red fluid having a strong burnt oil odor was noted at Test Pit 5.

A greenish-yellow fluid was observed seeping through the sidewall in Test Pit 9. The highest PID reading of 224 parts-per-million (ppm) was recorded at Test Pit 9 for the 5 to 7 feet bgl interval which consisted of cinders, slag, and concrete rubble.

3.3.7 Test Pit Liquid Analytical Results

ENCOTEC conducted testing of liquid/product samples collected from Test Pits 1, 5, 8, and 9. Samples from these test pits were selected due to the presence of black oily product or colored liquids. The test pit liquid samples were analyzed for the following parameters:

- Ammonia.
- Cyanide.

- Michigan Ten Metals.
- VOCs.
- BN's.

All samples were delivered to the laboratory under chain of custody documentation. Analytical results are presented in Tables 16 through 18, and all results were compared to the potentially applicable groundwater cleanup criteria summarized in Table 20.

Ammonia

Analytical results for ammonia in test pit liquid water samples are presented in Table 16. All four test pit water samples contained ammonia at concentrations that exceed the GSI Criterion as follows:

Compounds	Samples	
Ammonia	Test Pit-1	Test Pit-8
	Test Pit-5	Test Pit-9

Cyanide

Analytical results for cyanide are presented in Table 16. The following three test pit liquid samples contained cyanide concentrations that exceed the GSI Criterion:

Compound	Samples
Cyanide	Test Pit-5
	Test Pit-8
	Test Pit-9

Michigan Ten Metals

Analytical results for the Michigan Ten Metals in the test pit liquid samples are presented in Table 16. Three samples contained one or more of the following metals at concentrations that exceed GSI Criteria:

Metals		Samples
Arsenic	Mercury	Test Pit-1
Cadmium	Selenium	Test Pit-5
Lead	Silver	Test Pit-8

None of the test pit water samples contained Michigan Ten Metals concentrations that exceed the GCC.

VOCs

Analytical data for VOCs are presented in Table 17. Three test pit water samples contained at least one of the following VOC's at concentrations that exceed the GSI Criteria:

VOCs	Samples
Benzene	Test Pit-5
Ethylbenzene	Test Pit-8
Naphthalene	Test Pit-9
Total Xylenes	

No water samples analyzed contained VOC concentrations that exceed the GCC.

BNs

Analytical results for BNs in the test pit water samples are summarized and presented in Table 18. Two test pit water samples contained at least one of the following BN compounds in concentrations that exceed GSI Criteria:

BN Compounds	Samples
Acenaphthene	Test Pit-5
Fluorene	Test Pit-9
Naphthalene	
Phenanthrene	

No test pit water samples contained BN concentrations that exceed the GCC or GVIC.

3.3.8 Test Pit Product Analytical Results

ENCOTEC tested product/liquid samples collected from Test Pits 1, 5, 8, and 9. The samples from Test Pit 1 and 5 contained separate oil and liquid fractions. The quantity of free-phase oily material present in the sample from Test Pit 5 was insufficient for laboratory analysis. Therefore, only free-phase oily material from Test Pit 1 was analyzed for the following parameters:

- BN's.

All samples were delivered to the laboratory under chain of custody documentation. Analytical results are summarized in Table 19, and all results were compared to the potentially applicable groundwater cleanup criteria in Table 20.

BNs

Analytical results for BNs in the test pit product samples are summarized and presented in Table 19. The product sample from Test Pit 1 contained at least one of the following BN compounds in concentrations that exceed GSI Criteria:

BN Compounds		Samples
Acenaphthene	Phenanthrene	Test Pit-1
Fluorene	Pyrene	
Naphthalene		

The Test Pit 1 product sample did not contain BN concentrations that exceed the GCC or GVIC.

3.3.9 Physical Soil Testing Results

Shelby tube samples of the upper clay material were collected at "deep" boring locations SB-A302-D (11.5-14' bgl), SB-B303-D (10-12.5' bgl), SB-B306-D (9.5-12' bgl), and SB-D312-D (15-17' and 17-19' bgl). Shelby tube samples were also attempted at boring locations SB-C319-D and SB-E314-D; however, samples could not be recovered at those locations.

The Shelby tube samples were submitted to STS Consultants geotechnical laboratory located in Lansing, Michigan for grain size, hydrometer, and permeability testing (hydraulic conductivity). The geotechnical test results for SB-A302-D (11.5-14' bgl), SB-B303-D (10-12.5' bgl), SB-B306-D (9.5-12' bgl), and SB-D312-D (15-17' and 17-19' bgl) are presented in Appendix E and are summarized in the following paragraphs.

STS reported that when the clay sample from SB-312-D (15-17') was removed from the tube, the sample contained fill material with some interbedded layers of sand and silt. This sample was determined to not be representative, therefore, was not subjected to the hydraulic conductivity testing. In addition, two samples from SB-A302-D were tested for permeability because the first sample tested showed early breakthrough, and upon closer examination it contained sand stringers. A more uniform clay sample from SB-A302-D was subsequently set up and analyzed.

The percent passing the 200 mesh sieve for samples collected from grain size testing for SB-A302-D (11.5-14' bgl), SB-B303-D (10-12.5' bgl), SB-B306-D (9.5-12' bgl), and SB-D312-D (15-17' and 17-19' bgl) were 72.8 %, 99.2 %, 82.7 %, 33.0 %, and 74.4 %, respectively.

Hydrometer testing was also performed on each Shelby tube sample. Review of the hydrometer testing data showed that the silt and clay content ranged from approximately 70 % to 95 %, with the exception of sample SB-D312-D (15-17' bgl). The sample from SB-D312-D (15-17' bgl) contained approximately 30 % silt and clay.

The dry unit weight for clay samples collected from the upper clay unit ranged from 88.3 to 106.0 pounds per cubic foot (pcf).

The hydraulic conductivity for upper clay samples was determined using ASTM D 5084, Method C. The hydraulic conductivity values for SB-A302-D (11.5-14' bgl), SB-B303-D (10-12.5' bgl), SB-B306-D (9.5-12' bgl), and SB-D312-D (17-19' bgl) were 8.7E-7, 1.5E-7, 1.2E-7, and 9.1E-8 centimeters per second (cm/s). The average hydraulic conductivity for the upper clay based on samples collected from the site is 3.1E-7 cm/s.

4.0. SUMMARY OF FINDINGS

The following conclusions were reached based on field observations, review of prior site data, and data and information collected during February and March 1999.

1. Floating product, sinking product, or water having an oily sheen were observed at Test Pits 1, 2, 4, 5, 7, 8, 10, 13, 14, and 15.

2. An oily, free flowing material was observed near the north property boundary in Test Pit 1. It is not known whether the material is migrating onto the Detroit Coke property from the Yellow Freight property or it originates at the Detroit Coke property.

3. Sinking and floating product was observed in monitoring wells MW-101, MW-102, MW-117, and P-6D.

4. A white pasty ("oolitic") fill material was observed at many locations across the site. This material has a pH greater than 12.

5. The pH of groundwater collected from monitoring wells in the vicinity of the white fill material exceeds 12 and in some it exceeds 13.

6. The concentrations of VOCs and BNs, specifically benzene and naphthalene, in soil samples obtained in 1999 were in general similar to those reported in 1998. The soil samples obtained from seven of the ten test pits tested contained BNs at concentrations that exceed GSI Criteria.

7. The concentrations of ammonia and cyanide in soil exceed the GSI Protection Criteria in many locations. The concentrations of ammonia and cyanide in samples collected in 1999 were in general similar to those reported in 1998. Ammonia was

present in soil from Test Pit 7 at a concentration 300 times greater than the GSI Criterion.

8. RCRA parameter testing including reactive cyanide, pH, flash point, and reactive sulfide determined that the material excavated from the Test Pits is non-hazardous.

9. The SPLP testing of materials from 10 Test Pits revealed that naphthalene and ammonia are leachable under the SPLP test conditions. Acenaphthene, flouranthene, fluorene, and phenanthrene are slightly leachable in the SPLP test.

10. The upper clay unit was encountered at most locations tested across the site, and it is present within 50 to 200 feet of the Detroit and Rouge Rivers. The thickness of the clay unit ranged from approximately 5 to 10 feet across the site. The hydraulic conductivity of the clay unit averaged 3.1E-07 cm/s.

11. The surface water inflow to the site is variable. Comparison between 1998 and 1999 groundwater elevation data revealed that the surface water intrusion to the site may be several hundred feet at times.

12. The concentration of benzene in groundwater exceeds the GSI Criterion at seven locations. Four benzene plumes were identified. Two of the four plumes appear to be located within the interface between site groundwater and surface water.

13. Groundwater containing benzene concentrations above the GSI Criterion appear to be migrating offsite onto the adjacent Detroit Edison Property.

14. The concentrations of naphthalene in groundwater exceed the GSI Criterion at 13 locations. Four naphthalene plumes were identified. Three of the four plumes appear to be within the interface between site groundwater and surface water.

15. The ammonia concentrations in groundwater exceed the GSI Criterion at 39 locations. Furthermore, the ammonia concentration in groundwater along the Detroit Edison property line is greater than 100 times the GSI Criterion. The ammonia concentration exceeded 1,000 times the GSI Criterion at six locations that appear to be within the interface between site groundwater and surface water.

16. The cyanide concentrations exceed the GSI criterion in groundwater at 36 monitoring wells, including approximately 13 monitoring wells located within the interface between site groundwater and surface water. The cyanide concentration exceeds 100 times the GSI Criterion at four locations that appear to be within the interface between site groundwater and surface water.

MALCOLM PIRNIE

5.0 REFERENCES

1. Malcolm Pirnie, Supplemental Site Evaluation Work Plan. February 1999.

Table 1
Former Detroit Coke Site
Soil Analytical Results
Metals and General Chemistry

Sample Designation	SB-A301 (8-10')	SB-A302 (10-12')	SB-B303 (8-10')	SB-B304 (12.5-14.5')	SB-B305 (6-8')	SB-B306 (8-10')	SB-B307 (10-12')	SB-C308 (8-10')	SB-C309 (8-10')	SB-C310 (12-14')	SB-D311 (12-14')	SB-D312
Ammonia	3600	55000	28000	68000	41000	17000	2800	35000	[illegible]	6900	[illegible]	67000
Cyanide	<200	<200	<200	<200	790	<200	540	**270**	[illegible]	<200	[illegible]	<200
Arsenic	19000	**1300**	**8700**	**3000**	**3000**	**1400**	**1500**	**8600**	**5400**	**2200**	**3200**	**3300**
Barium	**86000**	**23000**	**31000**	**8600**	**37000**	**35000**	**5000**	**42000**	90000	**39000**	**38000**	**79000**
Cadmium	**320**	**130**	**280**	**77**	**140**	<50	<50	**250**	**420**	**110**	**190**	**240**
Chromium	20000	**11000**	**11000**	**6800**	**12000**	**14000**	**5000**	**8000**	22000	**12000**	**9900**	23000
Copper	**24000**	**20000**	**15000**	**16000**	**26000**	**24000**	**8200**	**16000**	**18000**	**14000**	**18000**	**37000**
Lead	**16000**	**6600**	**7400**	**4900**	**7800**	**5900**	**3900**	**9300**	22000	**7100**	**11000**	**11000**
Mercury	<100	<100	<100	<100	<100	<100	<100	**160**	180	<100	<100	<100
Selenium	<500	<500	<500	<500	<500	<500	<500	850	2200	<500	<500	1000
Silver	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Zinc	73000	**30000**	**28000**	**21000**	**39000**	**43000**	**23000**	**22000**	58000	**30000**	**45000**	51000

Notes:
Results reported in ug/kg.
Samples collected on February 11, 12, 15 through 18 and February 23, 1999.

Bold indicates analyte detected above method detection limit.
[shaded] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.

Table 1
Former Detroit Coke Site
Soil Analytical Results
Metals and General Chemistry

Sample Designation	SB-D313 (12-14')	SB-E314 (10-12')	SB-E315 (10-12')	SB-E316 (10-12')	SB-E317 (16-18')	SB-E317-Dup	SB-E318 (12-14')	SB-C319 (10-12')	SB-C320 (8-10')	SPOON-2 filtrate (ug/L)	SPOON-3 filtrate(ug/L)
Ammonia	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	<1000	<80	
Cyanide	[redacted]	[redacted]	<200	[redacted]	**380**	[redacted]	[redacted]	[redacted]	<200	<10	
Arsenic	**6100**	[redacted]	**7700**	**6200**	**6900**	**6000**	**7200**	[redacted]	**4000**	<5	<5
Barium	**40000**	[redacted]	**96000**	**56000**	**61000**	**120000**	**48000**	**78000**	**31000**	<200	<200
Cadmium	**130**	[redacted]	**91**	**190**	**180**	**150**	**520**	**550**	**210**	<0.5	<0.5
Chromium	**9100**	[redacted]	**6700**	[redacted]	**17000**	**17000**	**13000**	[redacted]	**3500**	<50	<50
Copper	**26000**	[redacted]	**33000**	**33000**	**25000**	**28000**	[redacted]	**37000**	**21000**	<25	<25
Lead	**9700**	[redacted]	**16000**	**20000**	**9100**	**9500**	[redacted]	[redacted]	**7400**	<3	<3
Mercury	**140**	[redacted]	[redacted]	[redacted]	<100	<100	[redacted]	[redacted]	**110**	<0.2	<0.2
Selenium	[redacted]	[redacted]	[redacted]	[redacted]	<500	<500	<500	[redacted]	<500	<5	<5
Silver	<500	<500	<500	<500	<500	<500	<500	<500	<500	<0.5	<0.5
Zinc	**31000**	[redacted]	**22000**	**44000**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	<20	**22**

Notes:
Results reported in ug/kg.
Samples collected on February 11, 12, 15 through 18 and February 23, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.

Table 2
Former Detroit Coke Site
Soil Analytical Results
Volatile Organic Compounds

Sample Designation	SB-A301 (8-10')	SB-A302 (10-12')	SB-B303 (8-10')	SB-B304 (12.5-14.5')	SB-B305 (6-8')	SB-B306 (8-10')	SB-B307 (10-12')	SB-C308 (8-10')	SB-C309 (8-10')	SB-C310 (12-14')	SB-D311 (12-14')	SB-D312	SB-D313 (12-14')	SB-E314 (10-12')
Benzene	<63	<66	<64	<62	<61	<68	<58	<62	**100**	**110**	<170000	<69	[redacted]	[redacted]
Carbon disulfide	<250	**3200**	<250	<250	<250	<250	<250	<250	<250	<250	<170000	<250	<280	<530
Naphthalene	<320	<330	<320	[redacted]	<300	<340	<290	<310	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Toulene	<63	<66	<64	<62	<61	<68	<58	<62	<84	<59	<170000	<69	**1000**	<530
1,2,4-Trimethylbenzene	<63	<66	<64	**220**	<61	<68	<58	<62	<84	<59	<170000	<69	<280	<530
1,3,5-Trimethylbenzene	<100	<100	<100	**810**	<100	<100	<100	<100	<100	<100	<170000	<100	<280	<530
Tetrachloroethene	<63	<66	<64	<62	<61	**100**	<58	<62	<84	<59	<170000	<69	<280	<530

Notes:
Results reported in ug/kg.
Samples collected on February 11, 12, 15 through 18 and February 23, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.

Table 2
Former Detroit Coke Site
Soil Analytical Results
Volatile Organic Compounds

Sample Designation	SB-E315 (10-12')	SB-E316 (10-12')	SB-E317 (16-18')	SB-E317-Dup	SB-E318 (12-14')	SB-C319 (10-12')	SB-C320 (8-10')	SPOON-2 water(ug/L)	SPOON-3 water(ug/L)
Benzene	**230**	[redacted]	<62	<65	**130**	<110	<72	<5	<5
Carbon disulfide	<250	<250	<250	<250	<250	<250	<250	<50	<50
Naphthalene	<280	<340	<310	[redacted]	[redacted]	[redacted]	<360	<5	-
Toulene	<77	**200**	<62	<65	**180**	<110	**160**	<1	<1
1,2,4-Trimethylbenzene	<77	<69	<62	<65	**190**	<110	<72	<5	-
1,3,5-Trimethylbenzene	<100	<100	<100	<100	<130	<110	<100	<5	-
Tetrachloroethene	<77	<69	<62	<65	<130	<110	<72	<1	<1

Notes:
Results reported in ug/kg.
Samples collected on February 11, 12, 15 through 18 and February 23, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.

Table 3
Former Detroit Coke Site
Soil Analytical Results
Base Neutral Compounds

Sample Designation	SB-A301 (8-10')	SB-A302 (10-12')	SB-B303 (8-10')	SB-B304 (12.5-14.5')	SB-B305 (6-8')	SB-B306 (8-10')	SB-B307 (10-12')	SB-C308 (8-10')	SB-C309 (8-10')	SB-C310 (12-14')	SB-D311 (12-14')	SB-D312	SB-D313 (12-14')	SB-E314 (10-12')
Acenaphthene	<330	**1500**	<330	**460**	<330	<330	<330	<330	**560**	<330	**610**	<330	<330	<330
Acenaphthylene	<330	**1600**	<330	<330	<330	<330	<330	**390**	**700**	<330	**600**	<330	<330	<330
Anthracene	<330	**4000**	<330	**450**	<330	**690**	<330	**1800**	**1500**	<330	**1600**	<330	<330	**380**
Benzo(a)anthracene	<330	**1500**	<330	**350**	<330	**450**	<330	**1600**	**1900**	<330	**4100**	<330	<330	**2400**
Benzo(a)pyrene	<330	<660	<330	<330	<330	<330	<330	**1300**	**1200**	<330	**3100**	<330	<330	**2100**
Benzo(b)fluoranthene	<330	**860**	<330	<330	<330	<330	<330	**2000**	**1800**	<330	**4000**	<330	<330	**3200**
Benzo(g,h,i)perylene	<330	<660	<330	<330	<330	<330	<330	**880**	**790**	<330	**1600**	<330	<330	**1300**
Benzo(k)fluoranthene	<330	<660	<330	<330	<330	<330	<330	**890**	**780**	<330	**1700**	<330	<330	**1600**
Chrysene	<330	**1100**	<330	**360**	<330	**380**	<330	**2500**	**1800**	<330	**3800**	<330	<330	**2300**
Dibenz(a.h)anthracene	<330	<660	<330	<330	<330	<330	<330	**410**	**350**	<330	**680**	<330	<330	**560**
Di-n-butyl phthalate	<330	<660	<330	<330	<330	<330	<330	<330	<330	<330	<530	<330	<330	<330
Fluoranthene	<330	**1500**	<330	**410**	<330	**730**	<330	**1800**	**1900**	<330	**8300**	<330	<330	**3700**
Fluorene	<330	**3100**	<330	**790**	<330	<330	<330	**400**	**1200**	<330	**570**	<330	<330	<330
Indeno(1,2,3-c,d)pyrene	<330	<660	<330	<330	<330	<330	<330	**690**	**560**	<330	**1800**	<330	<330	**1100**
Naphthalene	<330	**3100**	<330	**1200**	<330	<330	<330	**200**	**2700**	<330	**2600**	**3100**	**2800**	**750**
Phenanthrene	<330	**3100**	<330	**1600**	<330	**1600**	<330	**1400**	**2700**	<330	**4100**	<330	<330	**770**
Pyrene	<330	**2800**	<330	**1200**	<330	**940**	<330	**1600**	**2200**	<330	**5100**	<330	<330	**3200**

Notes:
Results reported in ug/kg.
Samples collected on February 11, 12, 15 through 18 and February 23, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.

Table 3
Former Detroit Coke Site
Soil Analytical Results
Base Neutral Compounds

Sample Designation	SB-E315 (10-12')	SB-E316 (10-12')	SB-E317 (16-18')	SB-E317-Dup	SB-E318 (12-14')	SB-C319 (10-12')	SB-C320 (8-10')	SPOON-2 water(ug/L)	SPOON-3 water(ug/L)
Acenaphthene	<330	<690	<330	<330	[redacted]	<330	<330	<5	<5
Acenaphthylene	**490**	**1200**	<330	<330	**2000**	<330	<330	<5	<5
Anthracene	**1200**	**2200**	<330	<330	**9900**	<330	**420**	<5	<5
Benzo(a)anthracene	**2700**	**6800**	<330	<330	**21000**	<330	**840**	<5	<5
Benzo(a)pyrene	**2400**	**6900**	<330	<330	**19000**	<330	**660**	<5	<5
Benzo(b)fluoranthene	**3600**	**9700**	<330	<330	**20000**	<330	**910**	<5	<5
Benzo(g,h,i)perylene	**1600**	**5200**	<330	<330	**8600**	<330	**480**	<5	<5
Benzo(k)fluoranthene	**1400**	**3800**	<330	<330	**7800**	<330	**450**	<5	<5
Chrysene	**2800**	**8100**	<330	<330	**18000**	<330	**900**	<5	<5
Dibenz(a.h)anthracene	**690**	**2200**	<330	<330	**2800**	<330	<330	<5	<5
Di-n-butyl phthalate	<330	<690	<330	<330	<1300	<330	<330	<5	**7.9**
Fluoranthene	**3000**	**8500**	<330	<330	**30000**	<330	**1200**	<5	<5
Fluorene	**390**	**690**	<330	<330	[redacted]	**390**	<330	<5	<5
Indeno(1,2,3-c,d)pyrene	**1300**	**4400**	<330	<330	**7100**	<330	**380**	<5	<5
Naphthalene	[redacted]	[redacted]	<330	<330	[redacted]	[redacted]	<330	<5	<5
Phenanthrene	[redacted]	[redacted]	<330	<330	[redacted]	**370**	**1100**	<5	<5
Pyrene	**3100**	**8600**	<330	<330	**33000**	<330	**1400**	<5	<5

Notes:
Results reported in ug/kg.
Samples collected on February 11, 12, 15 through 18 and February 23, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.

Table 4
Former Detroit Coke Site
MDEQ Part 201 Cleanup Criteria for Soils

Inorganics											
Ammonia											
Cyanide {R}							2.5E+5 {P}	=			
Arsenic {B}	70000 {X}	=									
Barium {B}											
Cadmium {B}	{G,X}										
Chromium {B}											
Copper {B}	{G}										
Lead {B}	{G,M,X}										
Mercury {B}											
Selenium {B}											
Silver {B}	500 {M}										
Zinc {B}	{G}						1.0E+9 {D}	=			
VOCs											
Benzene {I}	4000 {X}										
Carbon disulfide {I,R}							2.8E+5 {C}	=			
Ethylbenzene {I}				1.4 E+5 {C}			1.4 E+5 {C}				
Naphthalene											
n-Propylbenzene {I}											
Toulene {I}				2.5E+5 {C}	=		2.5E+5 {C}	=			
1,2,4-Trimethylbenzene {I}				1.1E+5 {C}	=		1.1E+5 {C}	=			
1,3,5-Trimethylbenzene {I}				94000 {C}	=		94000 {C}	=			
Tetrachloroethene	900 {X}						88000 {C}	=			
Vinyl Chloride											
Xylenes {I}				1.5E+5 {C}			1.5E+5 {C}				
Semi-VOCs											
Acenaphthene											
Acenaphthylene											
Anthracene				1.0E+9 {D}	=		1.0E+9 {D}	=			
Benzo(a)anthracene {Q}											
Benzo(a)pyrene {Q}											
Benzo(b)fluoranthene {Q}											
Benzo(g,h,i)perylene											
Benzo(k)fluoranthene {Q}											
Chrysene {Q}											
Dibenz(a.h)anthracene {Q}											
Di-n-butyl phthalate							7.6 E+5 {C}	=			
Fluoranthene				1.0E+9 {D}	=						
Fluorene				1.0E+9 {D}	=						
Indeno(1,2,3-c,d)pyrene {Q}											
Naphthalene											
Phenanthrene											
Pyrene				1.0E+9 {D}	=						

References:

GWP-GSI = Groundwater Protection, Groundwater Surface Water Interface Protection Criteria

Inhalation = Indoor Air, Soil Volatilization to Indoor Air Inhalation Criteria

IND-DC = Direct Contact, Industrial and Commercial II

{B} = Background as defined in Rule 299.5701©, may be substituted if higher than the calculated cleanup criteria.
Background levels may not exceed criteria for all inorganic compounds.

{C} = Value presented is a screening level based on chemical-specific generic soil saturation concentration (Csat) since the

calculated risk-based criterion is greater than Csat.

{D} = Calculated criterion exceeds 100%, hence it is reduced to 100% (i.e. 1.0E+9 ppb). Evaluation of free phase contaminant, envrionmental impacts, adverse aesthetics and acute or local toxicity is required.

{G} = The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV) and the surface water non-drinking water value (SWNDWV).

{I} = Chemical may exhibit the characteristic if ignitability as defined in 40 CFR 261.21. Contact an ERD toxicologist for further direction.

{P} = Criterion is based on the EPA action level for releasable cyanide.

{M} = Calculated criterion is below the analytical method detection limit (MDL), therefore, the criterion defaults to the MDL.

{Q} = All polychlorinated and polybrominated dibenzodioxins and dibenzofurans are considered as one hazardous substance.

{R} = Chemical may exhibit the characteristic of reactivity as defined in 40 CFR 261.23. Contact an ERD toxicologist for further direction.

{X} = For groundwater discharges to the Great Lakes and their connecting waters or discharges in close proximity to water supply intake(s) in inland surface waters, the generic GSI criterion is the Surface Water Drinking Water Value (SWDWV).

Notes:

For {G}, pH values were not determined therefore SWNDWV values were used.

ID = Inadequate data to develop criterion.

NLV = Chemical is not likely to volatilize under most conditions.

NLL = Chemical is not likely to leach under most soil conditions.

IP = Development of generic GSI value in process but not yet complete.

Table 5
Former Detroit Coke Site
Groundwater and Surface Water Elevations
Measured March 1, 1999

Well ID	TOC Elevation (Ft.)	Total Depth (Ft. BGL)	Depth to Water (Ft.)	Water Elevation
MW-100	583.60	9.0	9.67	573.93
MW-101	584.84	8.0	3.37	581.47
MW-102	584.67	7.5	2.40	582.27
MW-103	585.93	8.0	2.94	582.99
MW-104	585.61	11.0	11.37	574.24
MW-105	581.50	9.0	7.82	573.68
MW-106	584.01	20.0	9.84	574.17
MW-107S	581.94	9.0	8.25	573.69
MW-109	584.57	14.0	10.79	573.78
MW-110	585.72	8.5	5.13	580.59
MW-111	589.61	10.0	6.66	582.95
MW-112S	585.54	10.0	7.37	578.17
MW-112D	585.48	20.0	8.51	576.97
MW-113S	581.70	9.0	8.00	573.70
MW-114	581.48	12.0	6.69	574.79
MW-115	586.90	8.0	5.38	581.52
MW-116	591.37	8.0	6.92	584.45
MW-117	588.75	7.5	5.95	582.80
MW-118	586.83	8.0	4.71	582.12
MW-119D	587.53	23.0	12.74	574.79
MW-120	589.83	25.0	15.84	573.99
MW-121	587.25	14.0	12.81	574.44
MW-201	588.64	15.3	14.95	573.69
MW-202S	582.36	9.4	8.78	573.58
MW-202D	582.30	20.0	8.70	573.60
MW-203	587.05	14.0	12.98	574.07
MW-306D	586.50	23.0	12.29	574.21
MW-319D	581.97	25.0	8.18	573.79
MW-320	582.65	17.3	8.51	574.14
MW-321	587.05	24.0	13.11	573.94
MW-1	586.02	12.6	11.92	574.10
MW-2	587.23	12.7	12.83	574.40
MW-3	585.23	5.2	2.05	583.18
MW-4	591.90	8.0	7.22	584.68
MW-5	591.42	8.0	8.35	583.07
P-1S	589.74	13.0	8.25	581.49
P-2S	588.02	11.5	10.34	577.68
P-3S	583.15	12.5	9.34	573.81
P-4S	582.53	10.0	8.79	573.74
P-4D	583.23	46.3	10.00	573.23
P-5S	585.11	9.6	7.85	576.32
P-5D	585.62	20.0	10.20	575.42
P-6D	591.27	16.0	6.69	584.58
SG-1	577.48	-	4.00	573.5
SG-2	576.42	-	2.85	573.6
SG-3	581.19	-	7.60	573.6

Table 6
Former Detroit Coke Site
Vertical Aquifer Sampling
Volatile Organic Compounds

Sample Designation	SB-302	SB-B306		SB-D314			SB-E318			SB-D319			SB-E320	
Sample Interval	Deep	Deep	Intermediate	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow	Deep	Intermediate	Shallow	Deep	Intermediate
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	**1.8**	<1	<1	<1	<1	<1
Toluene	<1	**1.2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m & p Xylene	<2	**1.1 T**	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
o-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Styrene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	<1	**2.0**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	<5		**9.7**	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
2-Methylnaphthalene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

Notes:
Results reported in ug/l.
Samples collected on Feburary 19 through Feburary 25, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 6
Former Detroit Coke Site
Vertical Aquifer Sampling
Volatile Organic Compounds

Sample Designation	SB-E321	SB-E323	MW-202D	DUP-1	E.BLK-1	TB-1	T.BLK-2
Sample Interval	Deep		Deep				
Benzene	**2.2**	**400**	**1.4**	<1	<1	<1	<1
Toluene	**1.2**	**130**	<1	**1.2**	<1	<1	<1
Ethylbenzene	<1	**8.4**	<1	<1	<1	<1	<1
m & p Xylene	<2	[illegible]	**1.9 T**	**1.1 T**	<2	<2	<2
o-Xylene	<1	[illegible]	**1.6**	<1	<1	<1	<1
Styrene	<1	**31**	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	<1	**12**	**2.0**	<1	<1	<1	<1
1,2,4-Trimethylbenzene	<1	**23**	**4.9**	**2.0**	<1	<1	<1
Naphthalene	<5	**8100**	**100**	[illegible]	<5	<5	<5
2-Methylnaphthalene	<5	**230**	**33**	<5	<5	<5	<5

Notes:
Results reported in ug/l.
Samples collected on Feburary 19 through Feburary 25, 1999.

Bold indicates analyte detected above method detection limit.
(shaded) Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 7
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Dissolved Metals and General Chemistry

Sample Designation	MW-1	MW-3	MW-4	MW-100	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107S	MW-109	MW-110	MW-111
Cyanide					<10								<10	
Ammonia														
pH	8.6	9.0	8.4	7.8	12.0	9.3	9.4	7.8	NM	8.0	7.9	7.6	7.9	7.9
Arsenic	<5	**8.9**	<5	<5	**8.8**	**5.9**	**11**	**11**	<5	**21**	**12**	<5	**9.3**	**37**
Barium	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200		<200	<200
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Lead	<3	<3	<3.0	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Mercury	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	<5.0	<5.0	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5	
Silver	<0.5		<0.5	<.5		<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
Zinc	<20	<20	**28**	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Notes:
NA = Not Applicable
NM = Not Measured

Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 7

Former Detroit Coke Site

Groundwater and Surface Water Analytical Results

Dissolved Metals and General Chemistry

Sample Designation	MW-112S	MW-112D	MW-113S	MW-114	MW-115	MW-116	MW-117	MW-118	MW-118 DUP	MW-119D	MW-120	MW-121	MW-201
Cyanide				**15**									
Ammonia						<50							<50
pH	8.6	9.8	13.3	8.0	8.0	7.8	7.8	7.6	7.6	8.0	7.6	7.8	8.0
Arsenic	<5	**11**	<5	<5	**7.1**	<5	**17**	<5	<5	<5	**7.7**	<5	<5
Barium	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<25	<25	<25	**37**	<25	<25	<25	<25	<25	<25	<25	<25	<25
Lead	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	<5			<5	<5	<5	<5	<5	<5	<5		<5	
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	<0.5
Zinc	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Notes:
NA = Not Applicable
NM = Not Measured

Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 7

Former Detroit Coke Site

Groundwater and Surface Water Analytical Results

Dissolved Metals and General Chemistry

Sample Designation	MW-202S	MW-202D	MW-203	MW-306	MW-319	MW-320	MW-320 DUP	MW-321	P-1S	P-2S	P-3S	P-3S-DUP	P-4S
Cyanide	<10	100	[illegible]	**16**	[illegible]	26	[illegible]	[illegible]	[illegible]	70	[illegible]	[illegible]	[illegible]
Ammonia	160	210000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
pH	13.5	13.5	8.5	10.3	7.7	8.4	8.4	7.6	7.2	7.8	9.5	9.5	8.4
Arsenic	<5	<5	<5	**8.1**	<5	<5	<5	<5	**19**	<5	**17**	**15**	**17**
Barium	<200	<200	<200	<200	<200	<200	<200	250	<200	<200	<200	<200	<200
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Lead	<3	<3	<3	<3	<3	<3	<3	<3.0	<3.0	<3	<3	<3	<3
Mercury	<0.2	[illegible]	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	<5	<5	[illegible]	[illegible]	<5	[illegible]	[illegible]	[illegible]	<5.0	12	[illegible]	[illegible]	<5
Silver	<0.5	0.96	<0.5	<0.5	<0.5	<0.5	<0.5	[illegible]	[illegible]	<0.5	<0.5	<0.5	<0.5
Zinc	<20	<20	<20	**20**	**3200**	**2000**	**1700**	<20	**39**	**29**	<20	<20	<20

Notes:
NA = Not Applicable
NM = Not Measured

Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
(shaded) Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 7
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Dissolved Metals and General Chemistry

Sample Designation	P-4D	P-5S	P-5D	P-6D	SG-1 Detroit	SG-1 Detroit DUP	SG-2 Detroit/Rouge	SG-3 Rouge	Equipment Blank	FB-1
Cyanide	[illegible]	[illegible]	[illegible]	[illegible]	<10	<10	<10	<10	<10	<10
Ammonia	[illegible]	[illegible]	[illegible]	[illegible]	<50	<50	<50	<50	<50	<50
pH	6.5	8.2	8.1	8.9	NA	NA	NA	NA	NA	NA
Arsenic	<5	**6.7**	<5	**29**	<5	<5	<5	<5	<5	<5
Barium	[illegible]	<200	<200	<200	<200	<200	<200	<200	<200	<200
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	**87**	<25	<25	<25	<25	<25	<25	<25	<25	<25
Lead	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	<5	<5	[illegible]	[illegible]	<5	<5	<5	<5	<5	<5
Silver	[illegible]	<0.5	<0.5	[illegible]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	**6300**	<20	**350**	**560**	<20	<20	<20	<20	<20	<20

Notes:
NA = Not Applicable
NM = Not Measured

Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
[illegible] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 8
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Total Metals

Sample Designation	MW-105	MW-106	MW-107S	MW-109	MW-113S	MW-202S	MW-202D	P-3S	P-3S-DUP
Arsenic	<5	**22**	**12**	<5	<5	<5	<5	**17**	**17**
Barium	<200	<200	<200	[redacted]	<200	<200	<200	<200	<200
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<25	<25	<25	<25	<25	<25	<25	<25	<25
Lead	<3	<3	<3	<3	<3	<3	<3	<3	<3
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	[redacted]	<0.20	<0.2
Selenium	<5	<5	<5	<5	[redacted]	<5	<5	[redacted]	[redacted]
Silver	<0.5	[redacted]	[redacted]	<0.5	<0.5	[redacted]	[redacted]	[redacted]	[redacted]
Zinc	<20	<20	<20	<20	<20	<20	**130**	**75**	**79**

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 9
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Volatile Organic Compounds

Sample Designation	MW-1	MW-3	MW-4	MW-5	MW-100	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107S	MW-109
2-Propanone (Acetone)	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Butanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<1.0	**8.6**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	**7**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	<1.0	**8**	<1.0	<1.0	<1.0	1100	400	42.5	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	<1.0	**3**	**3.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	**1.3**	**5.3**	**5.2**	<1.0	<1.0	570	200	**4.6**	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.5**	<1.0	<1.0	<1.0
Naphthalene	<1.0	2	**1.1**	<1.0	<1.0	1400	1000	300	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methyl Naphthalene	<1.0	**1.7**	<1.0	<1.0	<1.0	**610**	**900**	**170**	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<100	**3.6**	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene	<1.0	<1.0	<1.0	<1.0	<1.0	100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m & p Xylene	<2.0	**3.1**	**2.8**	<2.0	<2.0	**270**	**240**	**12**	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	<1.0	**1.6**	**1.1**	<1.0	<1.0	**120**	<1.0	**6**	<1.0	<1.0	<1.0	<1.0	<1.0
Total Xylenes	<3.0	**4.7**	**3.9**	<3.0	<3.0	390	240	**18**	<3.0	<3.0	<3.0	<3.0	<3.0
Isopropylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
n-propylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**5**	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene	<1.0	**1.3**	<1.0	<1.0	<1.0	<1.0	<1.0	**8.9**	<1.0	<1.0	<1.0	<1.0	<1.0

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 9
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Volatile Organic Compounds

Sample Designation	MW-110	MW-111	MW-112S	MW-112D	MW-113S	MW-114	MW-115	MW-116	MW-117	MW-118	MW-118 DUP	MW-119D	MW-120
2-Propanone (Acetone)	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Butanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	<1.0	<1.0	<1.0	**1.6**	**2.2**	<1.0	**1.9**	<1.0	**150**	**470**	**430**	<1.0	**160**
2-Hexanone	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**3**	<1.0	<1.0	**3**
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	**1.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**56**	**43**	<1.0	**5.5**
Carbon Disulfide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene	**9.9**	**6.1**	<1.0	**11**	<1.0	**3.4**	**9.4**	<1.0	**<30**	**<100**	**<200**	<1.0	**1.3**
2-Methyl Naphthalene	**3.3**	**1.4**	<1.0	**22**	<1.0	**1.8**	**1.1**	<1.0	**46**	**59**	**50**	<1.0	**1.3**
Ethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**6.6**	**23**	**21**	<1.0	<1.0
Styrene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**4.3**	**3.4**	<1.0	<1.0
m & p Xylene	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**55**	**43**	<2.0	**3**
o-Xylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2**	**36**	**29**	<1.0	**1.1**
Total Xylenes	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	**2**	**91**	**72**	<3.0	**4.1**
Isopropylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**12**	**12**	<1.0	<1.0
n-propylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**3.7**	**3.4**	<1.0	<1.0
1,3,5-Trimethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2**	<1.0	<1.0	**8.6**	**7.1**	<1.0	<1.0
1,2,4-Trimethylbenzene	**1.1**	<1.0	<1.0	**1.5**	<1.0	<1.0	**2.3**	<1.0	**2.4**	**22**	**17**	<1.0	<1.0

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 9
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Volatile Organic Compounds

Sample Designation	MW-121	MW-201	MW-202S	MW-202D	MW-203	MW-306	MW-319	MW-320	MW-320 Dup	MW-321	P-1S	P-2S	P-3S
2-Propanone (Acetone)	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Butanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	**1.0**	<1.0	<1.0	**1.5**	**5.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**3.3**	**[redacted]**
2-Hexanone	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.9**
Carbon Disulfide	<1.0	<1.0	<1.0	**5.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene	<1.0	<1.0	<1.0	**11**	<1.0	**[redacted]**	<1.0	<1.0	<1.0	<1.0	**3.6**	<1.0	**[redacted]**
2-Methyl Naphthalene	<1.0	<1.0	<1.0	**4.9**	<1.0	**3.6**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**31**
Ethylbenzene	**1.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.6**
Styrene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m & p Xylene	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	**3.5**
o-Xylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.4**
Total Xylenes	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	**5.9**
Isopropylbenzene	**1.9**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
n-propylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	**3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**3.1**
1,2,4-Trimethylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**6.8**

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 9
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Volatile Organic Compounds

Sample Designation	P-3S Dup	P-4S	P-4D	P-5S	P-5D	P-6D	FB-1	SG-1 Detroit	SG-1 Detroit DUP	SG-2 Detroit/Rouge	SG-3 Rouge	Equipment Blank	Trip Blank
2-Propanone (Acetone)	<20	**31**	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Butanone	<10	**12**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	**50**	**60**	<1.0	<1.0	**150**	**490**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	<1.0	**1.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.6**	<1.0	**3.1**	**3**	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	**4.1**	**24**	<1.0	<1.0	**2.5**	**91**	<1.0	**4.6**	<1.0	**5.2**	**5.2**	**1.5**	<1.0
Carbon Disulfide	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Naphthalene	**90**	**270**	**5.4**	<1.0	**10**	**1000**	<1.0	<1.0	<1.0	**1.4**	<1.0	<1.0	<1.0
2-Methyl Naphthalene	**39**	**59**	**2**	<1.0	<1.0	**1000**	<1.0	<1.0	<1.0	**1.1**	<1.0	<1.0	<1.0
Ethylbenzene	**2.4**	**6.1**	<1.0	<1.0	**1.7**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene	<1.0	**6.4**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m & p Xylene	**4.8**	**26**	<2.0	<2.0	**2.9**	<2.0	<2.0	**2.5**	<2.0	**2.8**	**2.7**	<2.0	<2.0
o-Xylene	**3.4**	**19**	<1.0	<1.0	**3.3**	<1.0	<1.0	<1.0	<1.0	**1**	<1.0	<1.0	<1.0
Total Xylenes	**8.2**	**45**	<3.0	<3.0	**6.2**	<3.0	<3.0	**2.5**	<3.0	**3.8**	**2.7**	<3.0	<3.0
Isopropylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
n-propylbenzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	**4**	**6.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-Trimethylbenzene	**9**	**19**	<1.0	<1.0	**1.8**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 10
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Base Neutral Compounds

Sample Designation	MW-1	MW-3	MW-4	MW-100	MW-101	MW-102	MW-103	MW-104	MW-105	MW-106	MW-107S	MW-109	MW-110	MW-111	MW-112S
Acenaphthene	<5	<5	<5	<5	950	700	30	<5	<5	<5	<5	<5	<50	<5	<5
Acenaphthylene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Anthracene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Benzo[a]anthracene	<5	<5	<5	<5	<500	**500** [2]	<50	<5	<5	<5	<5	<5	<50	<5	<5
Benzo[a]pyrene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Benzo[b]fluoranthene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Benzo[ghi]perylene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Benzo[k]fluoranthene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Chrysene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Di-n-butyl phthalate	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	**7.6**	<5
Di-n-octyl phthalate	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Dibenz[a,h]anthracene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Fluoranthene	<5	<5	<5	<5	**1900** [1,2]	**2200** [1,2]	**56**	<5	<5	<5	<5	<5	<50	<5	<5
Fluorene	<5	<5	<5	<5	720	1200	70	<5	<5	<5	<5	<5	<50	<5	<5
Indeno[1,2,3-cd]pyrene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5
Naphthalene	**5.3**	<5	<5	<5	1300	1500	1000	<5	<5	<5	<5	<5	<50	81	<5
Phenanthrene	<5	<5	<5	<5	2400	6800	100	<5	<5	<5	<5	<5	<50	<5	<5
Pyrene	<5	<5	<5	<5	280	1300	<50	<5	<5	<5	<5	<5	<50	<5	<5
1,2,4-Trichlorobenzene	<5	<5	<5	<5	<500	<500	<50	<5	<5	<5	<5	<5	<50	<5	<5

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Shaded cells indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 10
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Base Neutral Compounds

Sample Designation	MW-112D	MW-113S	MW-114	MW-115	MW-116	MW-117	MW-118	MW-118 DUP	MW-119D	MW-120	MW-121	MW-201	MW-202S	MW-202D	MW-203
Acenaphthene	<5	<5	<5	<5	<5	[redacted]	<50	<50	<5	<5	**6.4**	<5	<5	<5	<5
Acenaphthylene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Anthracene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Benzo[a]anthracene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Benzo[a]pyrene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Benzo[b]fluoranthene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Benzo[ghi]perylene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Benzo[k]fluoranthene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Chrysene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Di-n-butyl phthalate	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Di-n-octyl phthalate	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Dibenz[a,h]anthracene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Fluoranthene	<5	<5	<5	**5.1**	<5	**44**	<50	<50	<5	<5	<5	<5	<5	<5	<5
Fluorene	<5	<5	<5	<5	<5	[redacted]	<50	<50	<5	<5	<5	<5	<5	<5	<5
Indeno[1,2,3-cd]pyrene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
Naphthalene	**7.9**	<5	<5	**11**	<5	<20	[redacted]	[redacted]	<5	<5	<5	<5	<5	**10**	<5
Phenanthrene	<5	<5	<5	<5	<5	<20	<50	[redacted]	<5	<5	<5	<5	<5	<5	<5
Pyrene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5
1,2,4-Trichlorobenzene	<5	<5	<5	<5	<5	<20	<50	<50	<5	<5	<5	<5	<5	<5	<5

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 10
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Base Neutral Compounds

Sample Designation	MW-306	MW-319	MW-320	MW-320 Dup	MW-321	P-1S	P-2S	P-3S	P-3S-DUP	P-4S	P-4D	P-5S	P-5D	P-6D	SG-1 Detroit
Acenaphthene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**20000** [1,2]	<5
Acenaphthylene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**5200** [1,2]	<5
Anthracene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**5600** [1,2]	<5
Benzo[a]anthracene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**8100** [2]	<5
Benzo[a]pyrene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5
Benzo[b]fluoranthene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**6800** [2]	<5
Benzo[ghi]perylene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5
Benzo[k]fluoranthene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5
Chrysene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5
Di-n-butyl phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	**9.4**
Di-n-octyl phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5
Dibenz[a,h]anthracene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5
Fluoranthene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**34000** [12]	<5
Fluorene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**16000** [1,2]	<5
Indeno[1,2,3-cd]pyrene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5
Naphthalene	**34**	<5	<5	<5	<5	<5	<5	**[illegible]**	**[illegible]**	**[illegible]**	<5	<5	**7.9**	**62000** [1,2]	<5
Phenanthrene	<5	<5	<5	<5	<5	<5	<5	**[illegible]**	**[illegible]**	**[illegible]**	<5	<5	<5	**55000** [1,2]	<5
Pyrene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	**25000** [1,2]	<5
1,2,4-Trichlorobenzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<5	<5	<5000	<5

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Shaded indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 10
Former Detroit Coke Site
Groundwater and Surface Water Analytical Results
Base Neutral Compounds

Sample Designation	SG-1 Detroit DUP	SG-2 Detroit/Rouge	SG-3 Rouge	Equipment Blank	FB-1
Acenaphthene	<5	<5	<5	<5	<5
Acenaphthylene	<5	<5	<5	<5	<5
Anthracene	<5	<5	<5	<5	<5
Benzo[a]anthracene	<5	<5	<5	<5	<5
Benzo[a]pyrene	<5	<5	<5	<5	<5
Benzo[b]fluoranthene	<5	<5	<5	<5	<5
Benzo[ghi]perylene	<5	<5	<5	<5	<5
Benzo[k]fluoranthene	<5	<5	<5	<5	<5
Chrysene	<5	<5	<5	<5	<5
Di-n-butyl phthalate	<5	<5	<5	<5	<5
Di-n-octyl phthalate	<5	<5	<5	<5	<5
Dibenz[a,h]anthracene	<5	<5	<5	<5	<5
Fluoranthene	<5	<5	<5	<5	<5
Fluorene	<5	<5	<5	<5	<5
Indeno[1,2,3-cd]pyrene	<5	<5	<5	<5	<5
Naphthalene	<5	<5	<5	<5	<5
Phenanthrene	<5	<5	<5	<5	<5
Pyrene	<5	<5	<5	<5	<5
1,2,4-Trichlorobenzene	<5	<5	<5	<5	<5

Notes:
Results reported in ug/l.
Samples collected on March 2 through March 5, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.

Table 11
Former Detroit Coke Site
Test Pit Soil Analytical Results
Metals and General Chemistry

Sample Designation	TEST PIT 1	TEST PIT 3	TEST PIT 4	TEST PIT 5	TEST PIT 7	TEST PIT 8	TEST PIT 9	TEST PIT 11	TEST PIT 13	TEST PIT 14
Ammonia	<1000	<1000	<1000	[redacted]	[redacted]	[redacted]	[redacted]	<1000	[redacted]	[redacted]
Cyanide	<200	**3300**	**13000**	[redacted]	**260**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Arsenic	**7100**	**4500**	[redacted]	**3500**	**10000**	**5700**	**8200**	**5100**	**10000**	**3100**
Barium	**71000**	**63000**	**80000**	**13000**	**61000**	**73000**	**73000**	**110000**	**78000**	**52000**
Cadmium	**210**	**220**	**450**	[redacted]	**110**	**270**	**230**	**320**	**140**	**240**
Chromium	**4900**	**9800**	**8000**	<2500	**14000**	[redacted]	[redacted]	[redacted]	**11000**	**10000**
Copper	**41000**	**20000**	**32000**	**7900**	**24000**	**30000**	[redacted]	**20000**	**30000**	**9900**
Lead	[redacted]	[redacted]	[redacted]	**8500**	**11000**	[redacted]	[redacted]	**14000**	[redacted]	**7900**
Mercury	[redacted]	[redacted]	[redacted]	[redacted]	**150**	[redacted]	[redacted]	[redacted]	[redacted]	<100
Selenium	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Silver	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Zinc	[redacted]	[redacted]	[redacted]	**19000**	**36000**	[redacted]	**42000**	[redacted]	**22000**	**27000**
Cyanide, reactive	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Flashpoint	200	200	200	200	200	200	200	200	200	200
pH	7.4	8.0	7.9	11.3	9.2	7.7	8.5	9.5	8.2	11.9
Sulfide, reactive	<50	<50	<50	650	<50	<50	6000	<50	<50	<50

Notes:
Results reported in ug/kg.
Samples collected on February 16 through 18, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.

Table 12
Former Detroit Coke Site
Test Pit Soil Analytical Results
Volatile Organic Compounds

Sample Designation	TEST PIT 1	TEST PIT 3	TEST PIT 4	TEST PIT 5	TEST PIT 7	TEST PIT 8	TEST PIT 9	TEST PIT 11	TEST PIT 13	TEST PIT 14
Benzene	<520	480	410	<220000	<20000	<17000	100000	<700	5700	<2000
Carbon disulfide	<520	<250	<250	<220000	<20000	<17000	<15000	<700	<1600	<2000
Ethylbenzene	<520	**310**	**110**	<220000	<20000	<17000	20000	<700	<1600	<2000
Naphthalene	2300	3200	47000	390000	90000	470000	330000	35000	23000	51000
n-Propylbenzene	**980**	<140	<100	<220000	<20000	<17000	<15000	<700	<1600	<2000
Toulene	<520	**170**	**400**	<220000	<20000	<17000	26000	<700	<1600	<2000
1,2,4-Trimethylbenzene	**4600**	**620**	**160**	<220000	<20000	**33000**	**44000**	<700	<1600	<2000
1,3,5-Trimethylbenzene	**1300**	**280**	<100	<220000	<20000	**20000**	**22000**	<700	<1600	<2000
Tetrachloroethene	<520	<140	<62	<220000	<20000	<17000	<15000	<700	<1600	<2000
Vinyl Chloride	570	<140	<100	<220000	<20000	<17000	<15000	<700	<1600	<2000
1,2-Xylene	<520	**190**	**150**	<220000	<20000	<17000	<15000	<700	<1600	<2000
1,3-Xylene and 1,4-Xylene	<1000	**1000**	**320**	<450000	<41000	<34000	**61000**	<1400	<3300	<3900
Total Xylenes	<520	1190	**470**	<22000	<20000	<17000	81000	<700	<1600	<2000

Notes:
Results reported in ug/kg.
Samples collected on February 16 through 18, 1999.

Bold indicates analyte detected above method detection limit.
[shaded] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.
[3] Indicates exceedance of Ambient Air Inhalation Criterion.

Table 13
Former Detroit Coke Site
Test Pit Soil Analytical Results
Base Neutral Compounds

Sample Designation	TEST PIT 1	TEST PIT 3	TEST PIT 4	TEST PIT 5	TEST PIT 7	TEST PIT 8	TEST PIT 9	TEST PIT 11	TEST PIT 13	TEST PIT 14
Acenaphthene	<6500	<1400	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	<1100	[redacted]	<1600
Acenaphthylene	<6500	<1400	**4900**	<560000	<43000	**3600**	<17000	<1100	**5800**	<1600
Anthracene	**7000**	**8300**	**21000**	**1900000** [2,4]	**160000** [4]	**9800**	**79000** [4]	**1900**	**20000**	**2700**
Benzo(a)anthracene	**13000**	**9200**	**14000**	**1400000** [2]	**280000** [2]	**14000**	**65000**	**6200**	**28000**	<1600
Benzo(a)pyrene	<6500	**10000**	**11000**	**600000** [2]	**140000** [2]	**8200**	**33000** [2]	**6400**	**22000** [2]	<1600
Benzo(b)fluoranthene	<6500	**12000**	**14000**	**980000** [2]	**170000**	**16000**	**64000**	**8200**	**34000**	<1600
Benzo(g,h,i)perylene	<6500	**7900**	**4900**	<560000	<43000	**5400**	<17000	5200	**12000**	<1600
Benzo(k)fluoranthene	<6500	**6000**	**7900**	<560000	**130000**	**7000**	**38000**	**2900**	**7800**	<1600
Chrysene	***19000***	***13000***	***15000***	***1300000***	***230000***	***14000***	***82000***	***6800***	***29000***	<1600
Dibenz(a.h)anthracene	<6500	**2800**	**2200**	<560000	<43000	**2700**	<17000	1600	**5900**	<1600
Fluoranthene	<6500	**14000**	**34000**	**7400000** [4]	**1000000** [4]	**27000**	**130000**	**8100**	**63000**	<1600
Fluorene	[redacted]	<1400	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	<1100	[redacted]	**2200**
Indeno(1,2,3-c,d)pyrene	<6500	**6400**	**4500**	<560000	<43000	**4600**	**17000**	**4700**	**15000**	<1600
Naphthalene	<6500	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	<1600
Phenanthrene	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pyrene	**15000**	**10000**	**33000**	**4100000** [4]	**1000000** [4]	**20000**	**100000**	**7600**	**36000**	<1600

Notes:
Results reported in ug/kg.
Samples collected on February 16 through 18, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Direct Contact Criterion.
[3] *Indicates exceedance of Ambient Air Inhalation Criterion.*
[4] Indicates exceedance of Groundwater Contact Protection Criterion.

Table 14
Former Detroit Coke Site
Test Pit SPLP Analytical Results
Metals and General Chemistry

Sample Designation	TEST PIT 1	TEST PIT 3	TEST PIT 4	TEST PIT 5	TEST PIT 7	TEST PIT 8	TEST PIT 9	TEST PIT 11	TEST PIT 13	TEST PIT 14
Ammonia										
Arsenic	<5	<5	<5	<5	**5.3**	<5	<5	<5	<5	<5
Barium	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Copper	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Lead	<3	**3.2**	**4.8**	<3	<3	<3	<3	<3	<3	<3
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	<5.0	<5.0	<5.0			<5.0	<5.0	<5.0		<5.0
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	**30**	<20	**39**	<20	<20	<20	<20	<20	<20	**30**

Notes:
Results reported in ug/l.
Samples collected on February 18, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.
[3] Indicates exceedance of Ambient Air Inhalation Criterion.

Table 15
Former Detroit Coke Site
Test Pit SPLP Analytical Results
Base Neutral Compounds

Sample Designation	TEST PIT 1	TEST PIT 3	TEST PIT 4	TEST PIT 5	TEST PIT 7	TEST PIT 8	TEST PIT 9	TEST PIT 11	TEST PIT 13	TEST PIT 14
Acenaphthene	**7**	<5	<5	<250	[redacted]	<5	<50	<5	[redacted]	<5
Acenaphthylene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Anthracene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Benzo(a)anthracene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Benzo(a)pyrene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Benzo(b)fluoranthene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Benzo(g,h,i)perylene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Benzo(k)fluoranthene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Chrysene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Dibenz(a.h)anthracene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Di-n-butyl phthalate	**6.8**	<5	<5	<250	<120	<5	<50	<5	<5	<5
Fluoranthene	<5	<5	<5	<250	<120	<5	<50	<5	**6.3**	<5
Fluorene	**7.3**	<5	<5	<250	[redacted]	<5	<50	<5	<5	<5
Indeno(1,2,3-c,d)pyrene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5
Naphthalene	[redacted]	[redacted]	<5	[redacted]	[redacted]	<5	[redacted]	**5.3**	<5	**6.9**
Phenanthrene	[redacted]	<5	<5	<250	[redacted]	<5	<50	<5	<5	<5
Pyrene	<5	<5	<5	<250	<120	<5	<50	<5	<5	<5

Notes:
Results reported in ug/l.
Samples collected on February 18, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.
[3] Indicates exceedance of Ambient Air Inhalation Criterion.

Table 16
Former Detroit Coke Site
Test Pit Water Analytical Results
Metals and General Chemistry

Sample Designation	TEST PIT 1	TEST PIT 5	TEST PIT 8	TEST PIT 9
Ammonia				
Cyanide	<10			
Arsenic	<5	<5		<5
Barium	<200	<200	<200	<200
Cadmium		<0.5	<0.5	<0.5
Chromium	<50	<50	<50	<50
Copper	<25	<25	<25	<25
Lead	**5.8**	<5		<5
Mercury		<0.2		<0.2
Selenium	<5			<5
Silver	<0.5			<0.5
Zinc	**32**	<20	**30**	<20

Notes:
Results reported in ug/l.
Samples collected on February 25, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.
[3] Indicates exceedance of Ambient Air Inhalation Criterion.

Table 17
Former Detroit Coke Site
Test Pit Water Analytical Results
Volatile Organic Compounds

Sample Designation	TEST PIT 1	TEST PIT 5	TEST PIT 8	TEST PIT 9
Benzene	<5	[redacted]	[redacted]	[redacted]
Carbon disulfide	<50	<50	<50	<500
Ethylbenzene	<1	**2**	[redacted]	<100
Naphthalene	<5	[redacted]	[redacted]	[redacted]
Styrene	<1	**2.1**	<10	<100
Tetrachloroethene	<1	<1	<10	<100
Toulene	<1	**11**	<10	<100
1,2,4-Trimethylbenzene	**5.3**	<5	**300**	**66**
1,3,5-Trimethylbenzene	<5	<5	**110**	<40
Vinyl Chloride	<1	<1	<10	<100
1,2-Xylene	<5	<5	**42**	<100
1,3-Xylene and 1,4-Xylene	<10	<10	**100**	**210**
Total Xylenes	<15	<15	[redacted]	[redacted]

Notes:
Results reported in ug/l.
Samples collected on February 25, 1999.

Bold indicates analyte detected above method detection limit.
[redacted] Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.
[3] Indicates exceedance of Ambient Air Inhalation Criterion.

Table 18
Former Detroit Coke Site
Test Pit Water Analytical Results
Base Neutral Compounds

Sample Designation	TEST PIT 1	TEST PIT 5	TEST PIT 9
Acenaphthene	<5	<20	40
Acenaphthylene	<5	<20	**31**
Anthracene	<5	<20	**170** [1,2]
Benzo(a)anthracene	<5	<20	**220** [2]
Benzo(a)pyrene	<5	<20	**140** [2]
Benzo(b)fluoranthene	<5	<20	**210** [2]
Benzo(g,h,i)perylene	<5	<20	**60** [2]
Benzo(k)fluoranthene	<5	<20	**76** [2]
Chrysene	<5	<20	**220** [2]
Dibenz(a.h)anthracene	<5	<20	**46** [2]
Di-n-butyl phthalate	<5	<20	<25
Fluoranthene	<5	<20	**350** [1,2]
Fluorene	<5	<20	70
Indeno(1,2,3-c,d)pyrene	<5	<20	**79** [2]
Naphthalene	<5	<20	300
Phenanthrene	<5	<20	470
Pyrene	<5	<20	**360** [1,2]

Notes:
Results reported in ug/l.
Samples collected on February 18, 1999.

Bold indicates analyte detected above method detection limit.
Indicates exceedance of GSI Criterion.
[1] Indicates exceedance of Indoor Air Inhalation Criterion.
[2] Indicates exceedance of Groundwater Contact Criterion.
[3] Indicates exceedance of Ambient Air Inhalation Criterion.

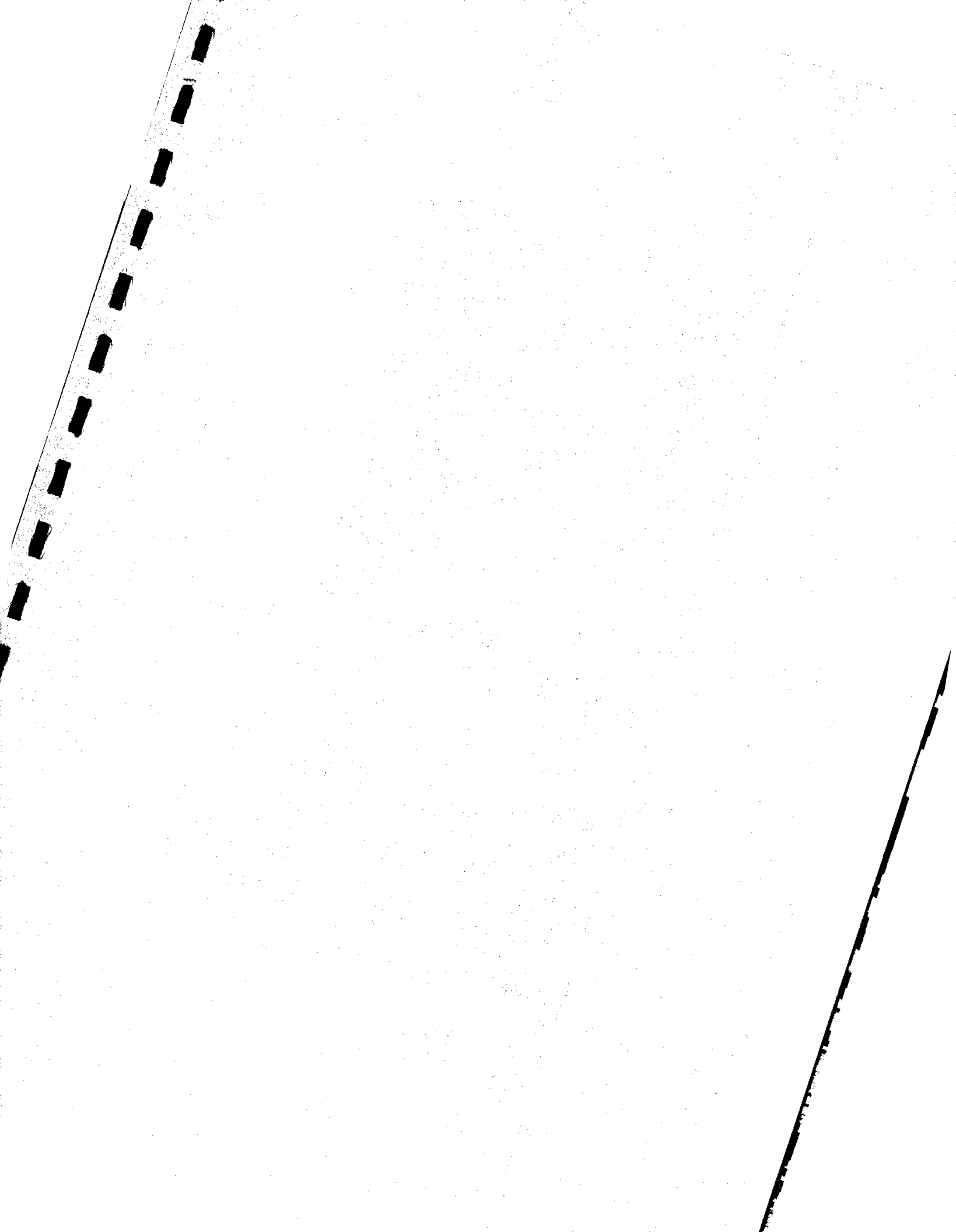


Table 19
Former Detroit Coke Site
Test Pit Free Product Analytical Results
Base Neutral Compounds

Sample Designation	TEST PIT 1
Acenaphthene	<50000
Acenaphthylene	<50000
Anthracene	<50000
Benzo(a)anthracene	**73000**
Benzo(a)pyrene	<50000
Benzo(b)fluoranthene	<50000
Benzo(g,h,i)perylene	<50000
Benzo(k)fluoranthene	<50000
Chrysene	**100000**
Dibenz(a.h)anthracene	<50000
Di-n-butyl phthalate	<50000
Fluoranthene	<50000
Fluorene	<50000
Indeno(1,2,3-c,d)pyrene	<50000
Naphthalene	<50000
Phenanthrene	**95000**
Pyrene	**93000**

Notes:
Results reported in ug/l.
Samples collected on February 25, 1999.
Bold indicates analyte detected above method detection limit.

Table 20
Former Detroit Coke Site
MDEQ Part 201 Cleanup Criteria for Groundwater

	GSI			IND-Inhalation			GCC		
Inorganics									
Cyanide {R}	20 {M}	=							
Ammonia	50 {M}	=							
Arsenic {B}	150 {X}	=							
Barium {B}									
Cadmium {B}	[G,X]	=							
Chromium {B,H}									
Copper {B}	{G}								
Lead {B}	{G,X}	=							
Mercury {B}	0.2 {M}	=					56 {S}	=	
Selenium {B}									
Silver {B}	0.2 {M}	=							
Zinc {B}	{G}	=							
VOCs									
2-Propanone (Acetone) {I}	18000 {M}	=							
2-Butanone {I}				2.4E+8 {S}	=		2.4E+8 {S}	=	
1,1-Dichloroethane {I}				5.1E+6 {S}	=				
1,1,1-Trichloroethane				1.3E+6 {S}	=				
Benzene {I}	200 {X}	=							
2-Hexanone {I}									
Tetrachloroethene	45 {X}	=							
Trichloroethene	200 {X}	=							
Toluene {I}				5.3E+5 {S}	=		5.3E+5 {S}	=	
Carbon Disulfide {I,R}									
Naphthalene				31000 {S}	=		31000 {S}	=	
2-Methyl Naphthalene									
Ethylbenzene {I}				1.7E+5 {S}	=		1.7E+5 {S}	=	
Xylenes {I}				1.9E+5 {S}	=		1.9E+5 {S}	=	
Styrene {I}				3.1E+5 {S}	=				
Isopropylbenzene [I}				56000 {S}	=		56000 {S}	=	
n-propylbenzene {I}									
1,3,5-Trimethylbenzene [I}				61000 {S}	=				
1,2,4-Trimethylbenzene {I}				56000 {S}	=				
BNA's									
Acenaphthene				4200{S}	=		4200{S}	=	
Acenaphthylene				3900 {S}	=		3900 {S}	=	
Anthracene				43 {S}	=		43 {S}	=	
Benzo[a]anthracene {Q}							5.0 {M}	=	
Benzo[a]pyrene {Q}							5.0 {M}	=	
Benzo[b]fluoranthene {Q}							5.0 {M}	=	
Benzo[ghi]perylene							5.0 {M}	=	
Benzo[k]fluoranthene {Q}									
Chrysene {Q}							5.0 {M}	=	
Di-n-butyl phthalate							11000 {S}	=	
Di-n-octyl phthalate									
Dibenz[a,h]anthracene {Q}							5.0 {M}	=	
Fluoranthene				210 {S}	=		210 {S}	=	
Fluorene				2000 {S}	=		2000 {S}	=	
Indeno[1,2,3-cd]pyrene {Q}							5.0 {M}	=	
Naphthalene				31000 {S}	=		31000 {S}	=	
Phenanthrene	5.0 {M}	=		1000 {S}	=		1000 {S}	=	
Pyrene				140 {S}	=		140 {S}	=	
1,2,4-Trichlorobenzene				3.0E+5 {S}	=				

Table 20
Former Detroit Coke Site
MDEQ Part 201 Cleanup Criteria for Groundwater

References:

GSI = Groundwater Surface Water Interface Criteria

IND-Inhalation = Industrial & Commercial II, III, IV Groundwater Volatilization to Indoor Air Inhalation Criteria

GCC = Groundwater Contact Criteria

{B} = Background as defined in Rule 299.5701©, may be substituted if higher than the calculated cleanup criteria. Background levels may not exceed criteria for all inorganic compounds.

{G} = The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV) and the surface water non-drinking water value (SWNDWV).

{H} = Valence specific chromium data (Cr III and Cr VI) must be compared to the corresponding valence-specific cleanup criteria.

{I} = Chemical may exhibit the characteristic if ignitability as defined in 40 CFR 261.21. Contact an ERD toxicologist for further direction.

{M} = Calculated criterion is below the analytical method detection limit (MDL), therefore, the criterion defaults to the MDL.

{Q} = All polychlorinated and polybrominated dibenzodioxins and dibenzofurans are considered as one hazardous substance.

{R} = Chemical may exhibit the characteristic of reactivity as defined in 40 CFR 261.23. Contact an ERD toxicologist for further direction.

{S} = Criterion defaults to the chemical-specific water solubility limit.

{X} = For groundwater discharges to the Great Lakes and their connecting waters or discharges in close proximity to water supply intake(s) in inland surface waters, the generic GSI criterion is the Surface Water Drinking Water Value (SWDWV).

Notes:

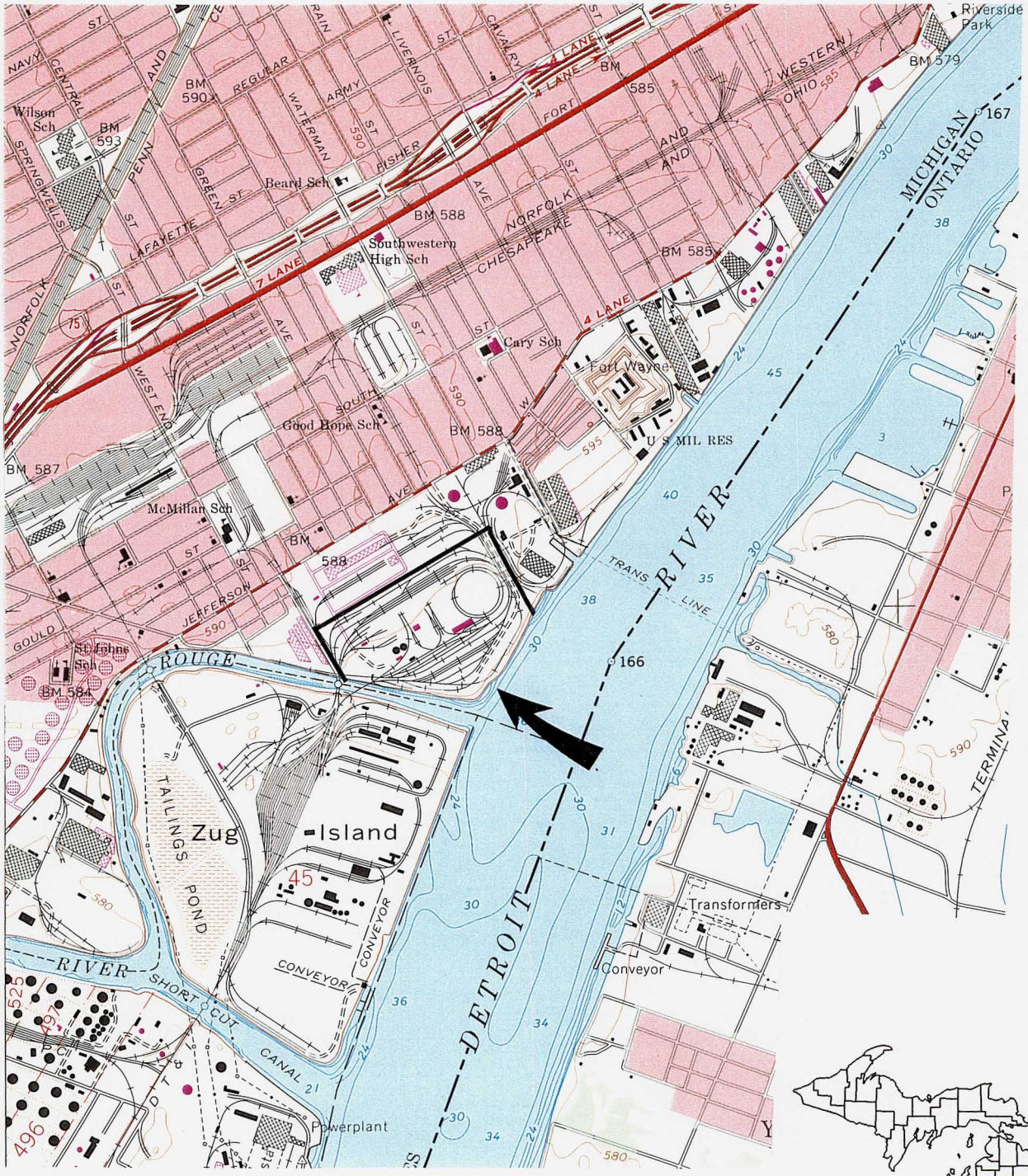
For {G}, pH values were not determined therefore SWNDWV values were used.

ID = Inadequate data to develop criterion.

NLV = Chemical is not likely to volatilize under most conditions.

NLL = Chemical is not likely to leach under most soil conditions.

IP = Development of generic GSI value in process but not yet complete.



SCALE: 1:24,000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

QUADRANGLE LOCATION

MALCOLM PIRNIE

FORMER DETROIT COKE SITE

DETROIT, MICHIGAN

SITE LOCATION

MALCOLM PIRNIE ENGINEERS, LLP
EAST LANSING, MICHIGAN

FIGURE 1-1

ZUG ISLAND ROAD
CHAIN LINK FENCE
GRID NORTH
TRUE NORTH
59°±
TP-1
TP-2
MW-4
P-6D
MW-111
P-1S
MW-116
SB-C307
MW-5
MW-117
SB-D311
TP-4
TP-3
SB-B303
SB-A301
MW-110/SB-71
TP-5
SB-E315
P-2S
MW-115
TP-6
MW-118
SB-E316
TP-8
MW-103
MW-201
SB-A302
MW-101
MW-3
SB-C308
MW-102
TP-10
TP-9
TP-7
SB-B304
MW-109
MW-321
SB-E317
MW-203
MW-120
MW-121
P-5S
P-5D
TP-11
MW-112S
MW-112D
SB-B305
SB-C309
MW-119D
SB-322
TP-12
SB-D312
TP-13
SB-323
SB-B306
MW-306D
MW-1
SB-E318
P-3S
MW-2
SB-C310
MW-106
SB-324
MW-104
MW-107S/SB-46
SB-D313
MW-100
TP-14
ROUGE RIVER
MW-320
APPROXIMATE PROPERTY LINE
SG-1
SG-3
SB-D314
MW-114
MW-319D
TP-15
MW-202S
MW-202D
MW-105
MW-113S
DETROIT RIVER
P-4S
P-4D
SG-2
LEGEND
TEST PIT
MONITORING WELL - FEBRUARY 1998
MONITORING WELL - FEBRUARY 1999
MONITORING WELL - PRE-1998
PIEZOMETER - PRE-1998
SOIL BORING
STAFF GAUGE
APPROXIMATE PROPERTY LINE
NOTES
1. BASE MAP SOURCE: SURVEY DATA BY WADE-TRIM SURVEYORS (MAY 1998 AND MARCH 1999)
2. THIS DRAWING MAY BE REPRODUCED FOR USE BY THE STATE OF MICHIGAN OR ITS AUTHORIZED REPRESENTATIVE.
SCALE IN FEET
0
50
100
200

User:6919 Job:2420108H73 File:I:\2420108\DWG\DCSBTPMWL2.DWG Scale:1:100 Date:03/31/1999 Time:11:43

MALCOLM PIRNIE

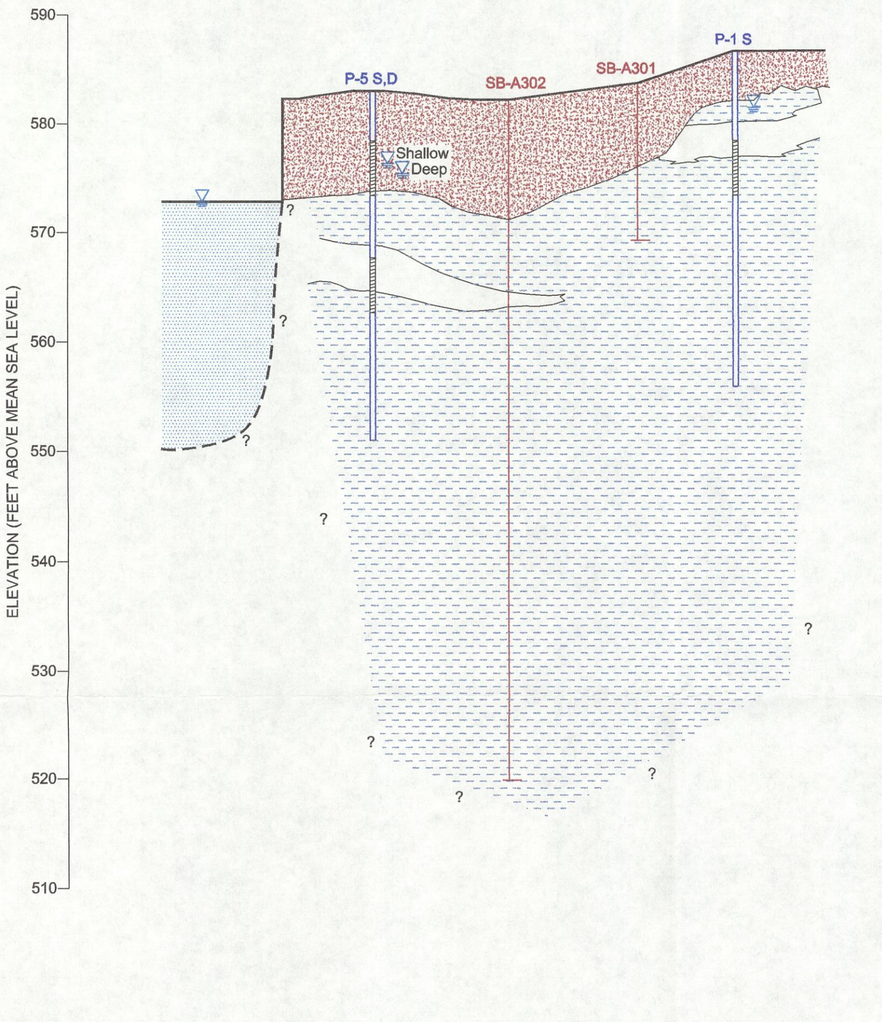
FORMER DETROIT COKE SITE

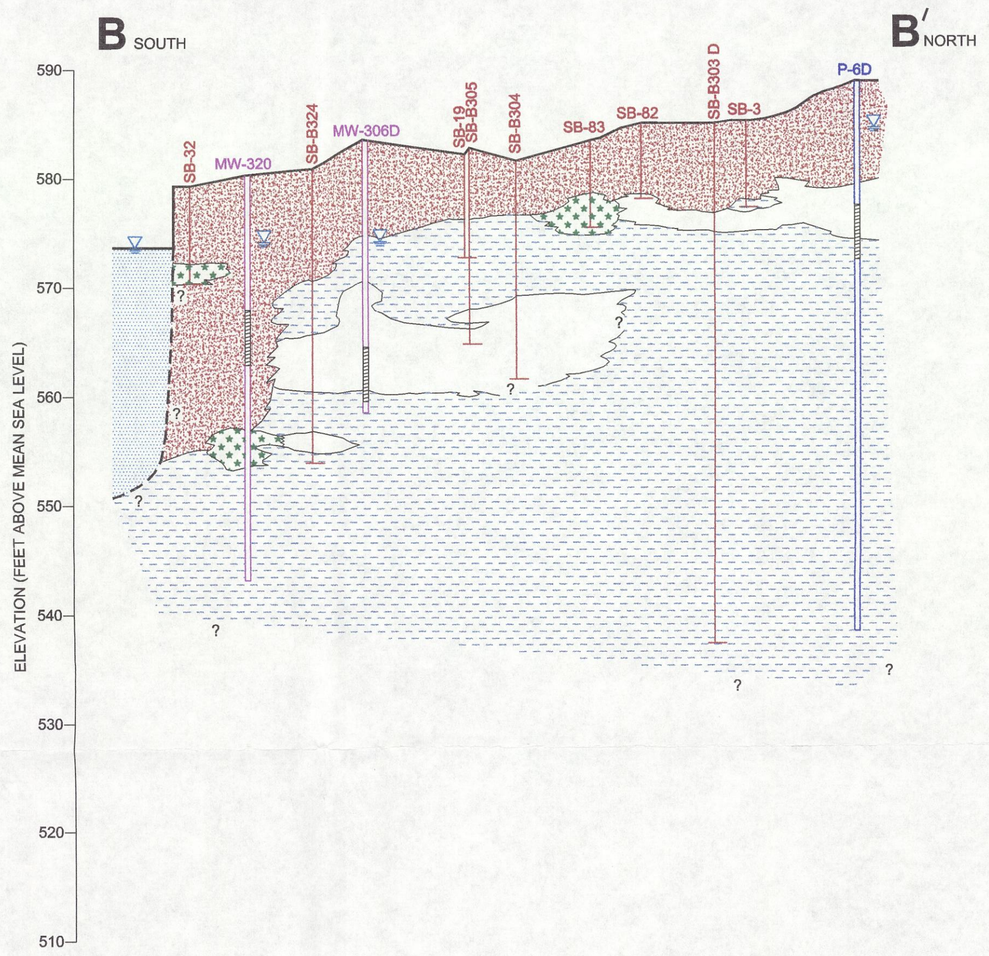
DETROIT, MICHIGAN

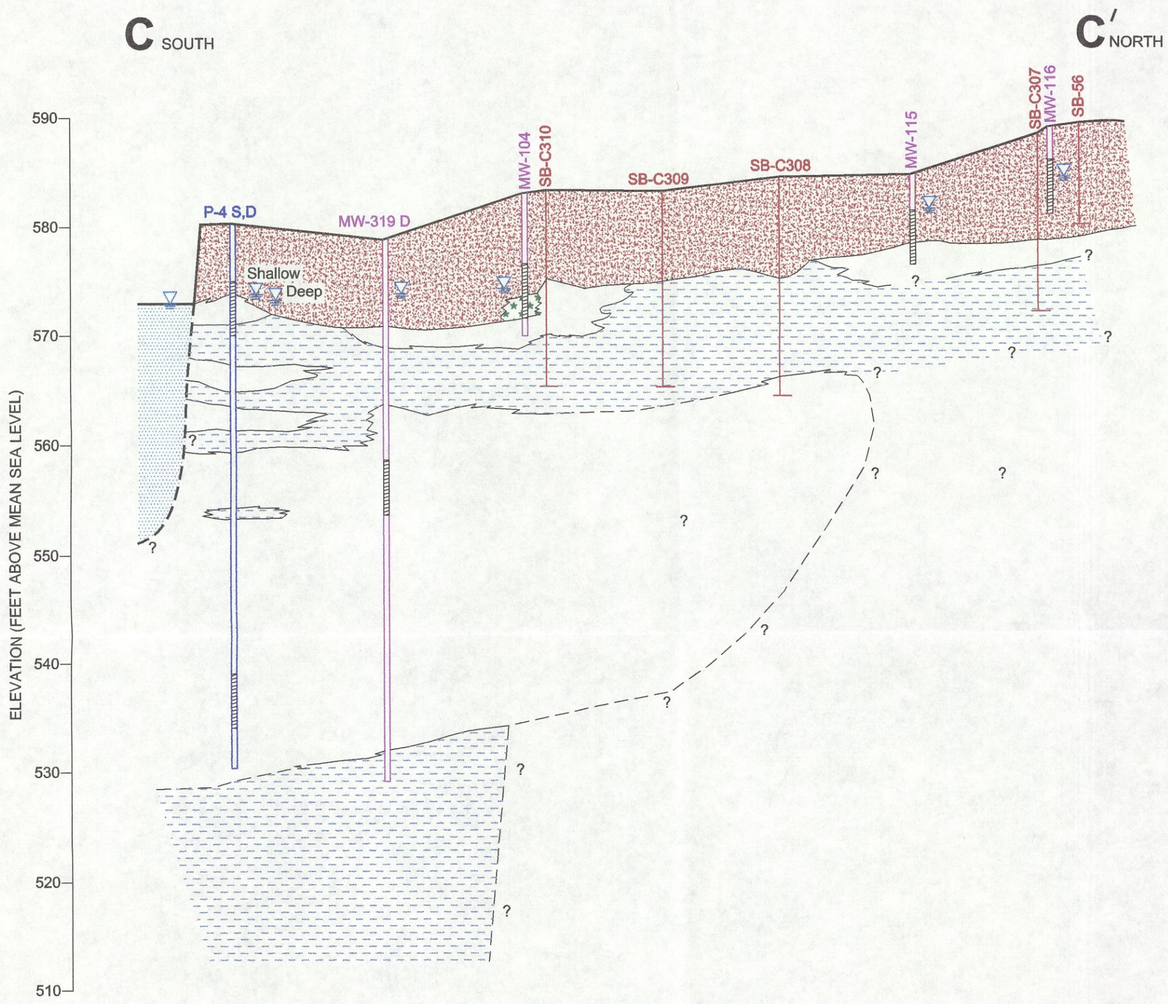
SOIL BORING, TEST PIT, AND MONITORING WELL LOCATIONS

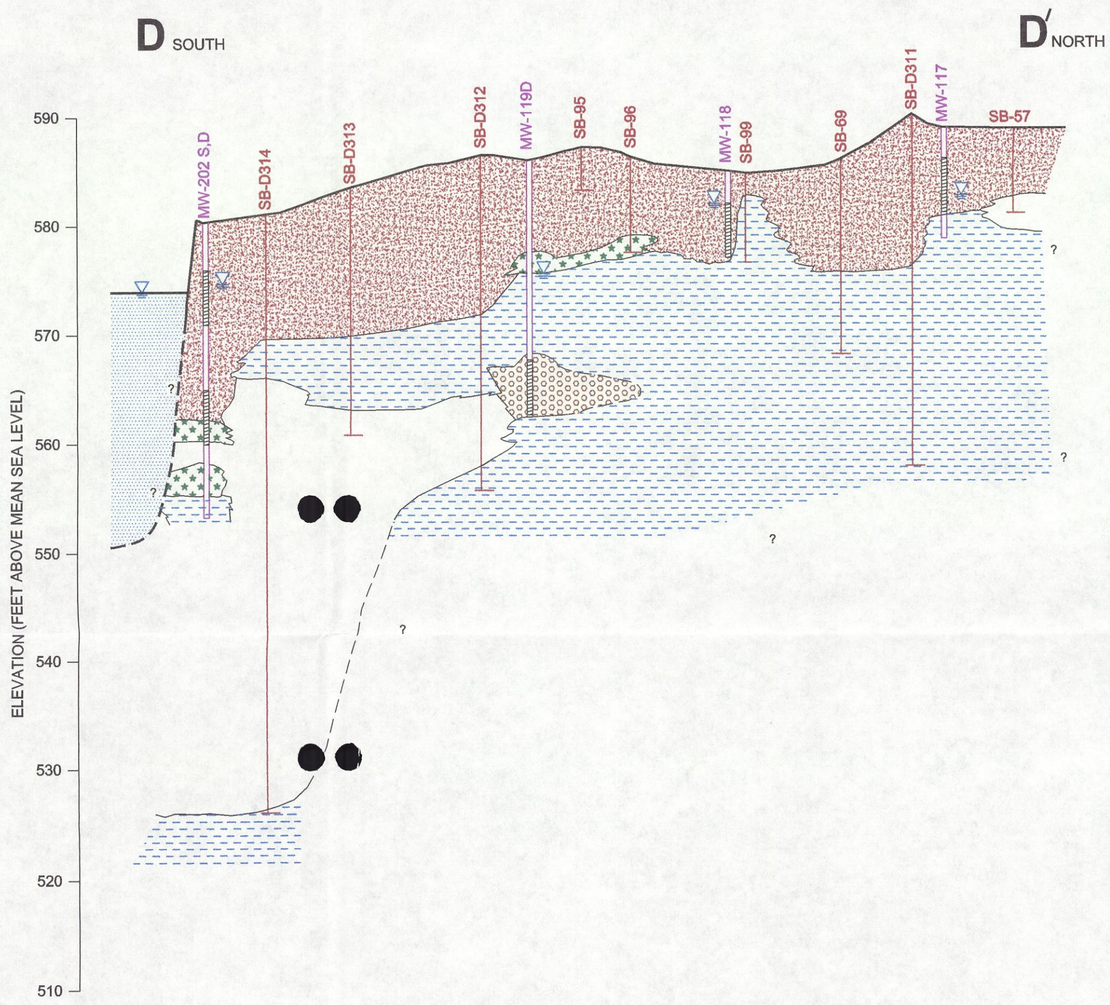
MALCOLM PIRNIE ENGINEERS, LLP
EAST LANSING, MICHIGAN

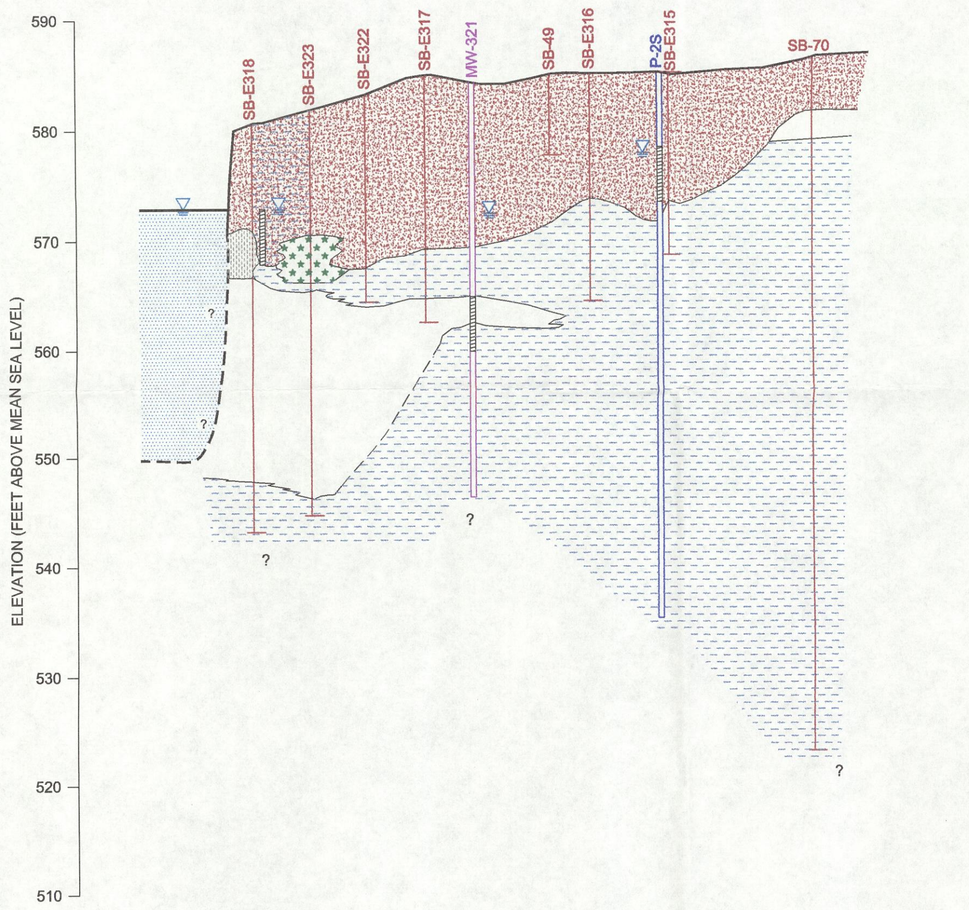
FIGURE 2-1

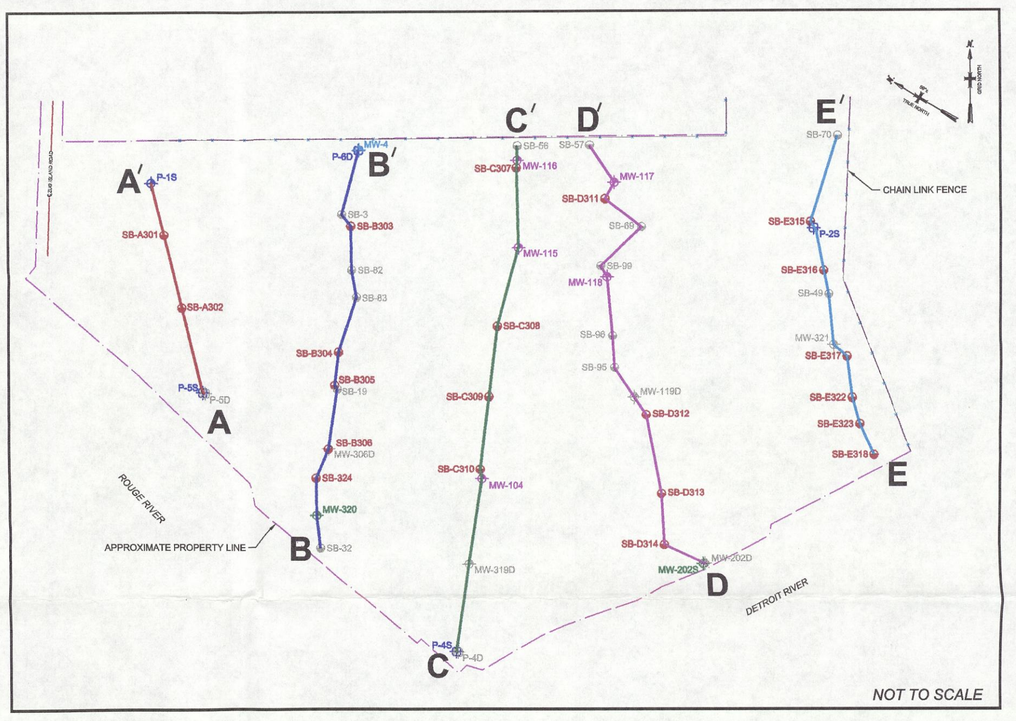












LEGEND

- FILL
- COARSE SAND AND/OR GRAVEL
- FINE TO MEDIUM SAND
- VERY FINE SAND OR SILT
- SANDY CLAY, SILTY CLAY, OR CLAY
- VERY FINE-GRAINED OR OOLITIC WHITE SOAPY MATERIAL
- WATER
- PERMANENT WELL SCREEN
- WATER LEVEL (MARCH 1, 1999)

NOTE

THIS DRAWING MAY BE REPRODUCED FOR USE BY THE STATE OF MICHIGAN OR ITS AUTHORIZED REPRESENTATIVE.

HORIZONTAL SCALE IN FEET

0 200 400

VERTICAL EXAGGERATION=10x

MALCOLM PIRNIE

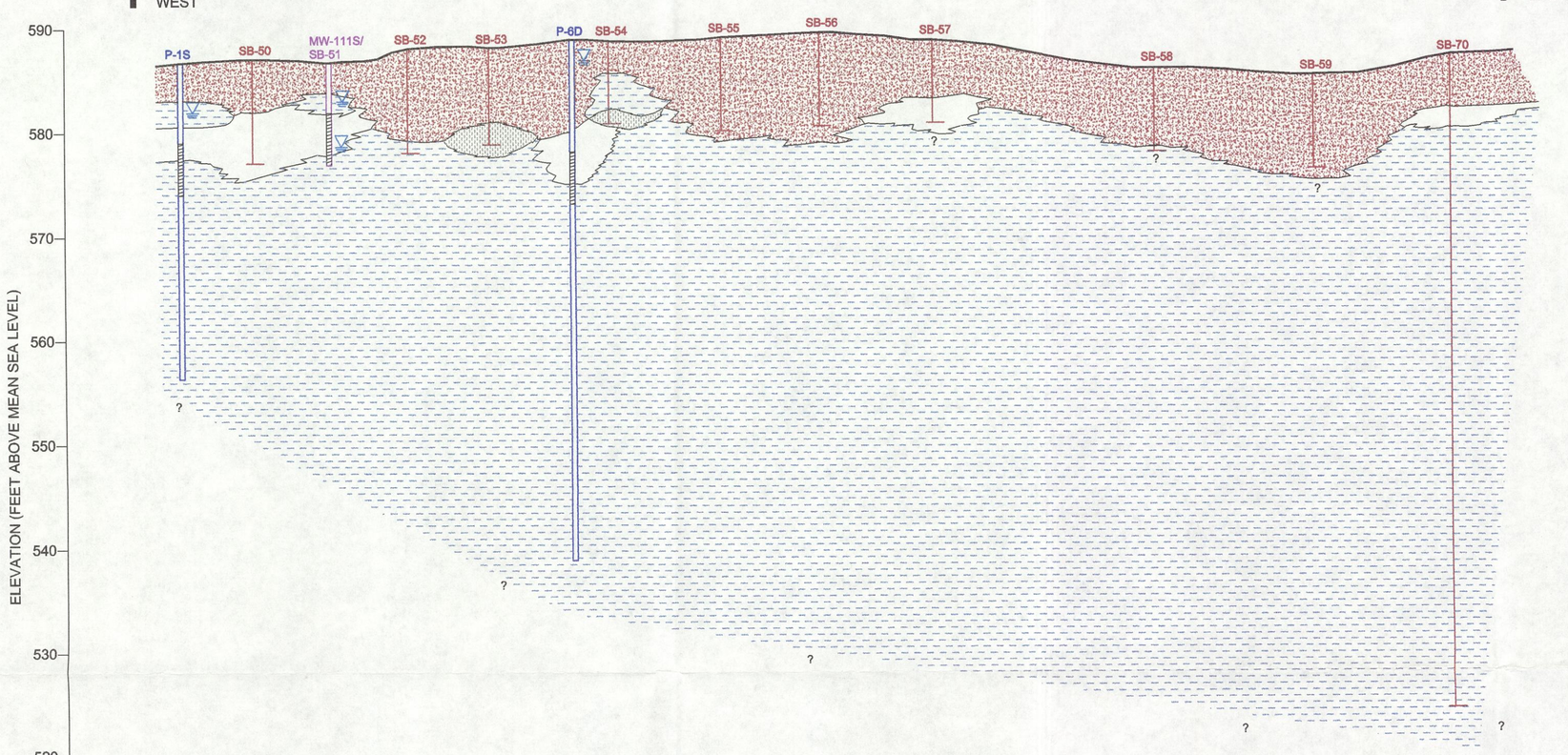
FORMER DETROIT COKE SITE

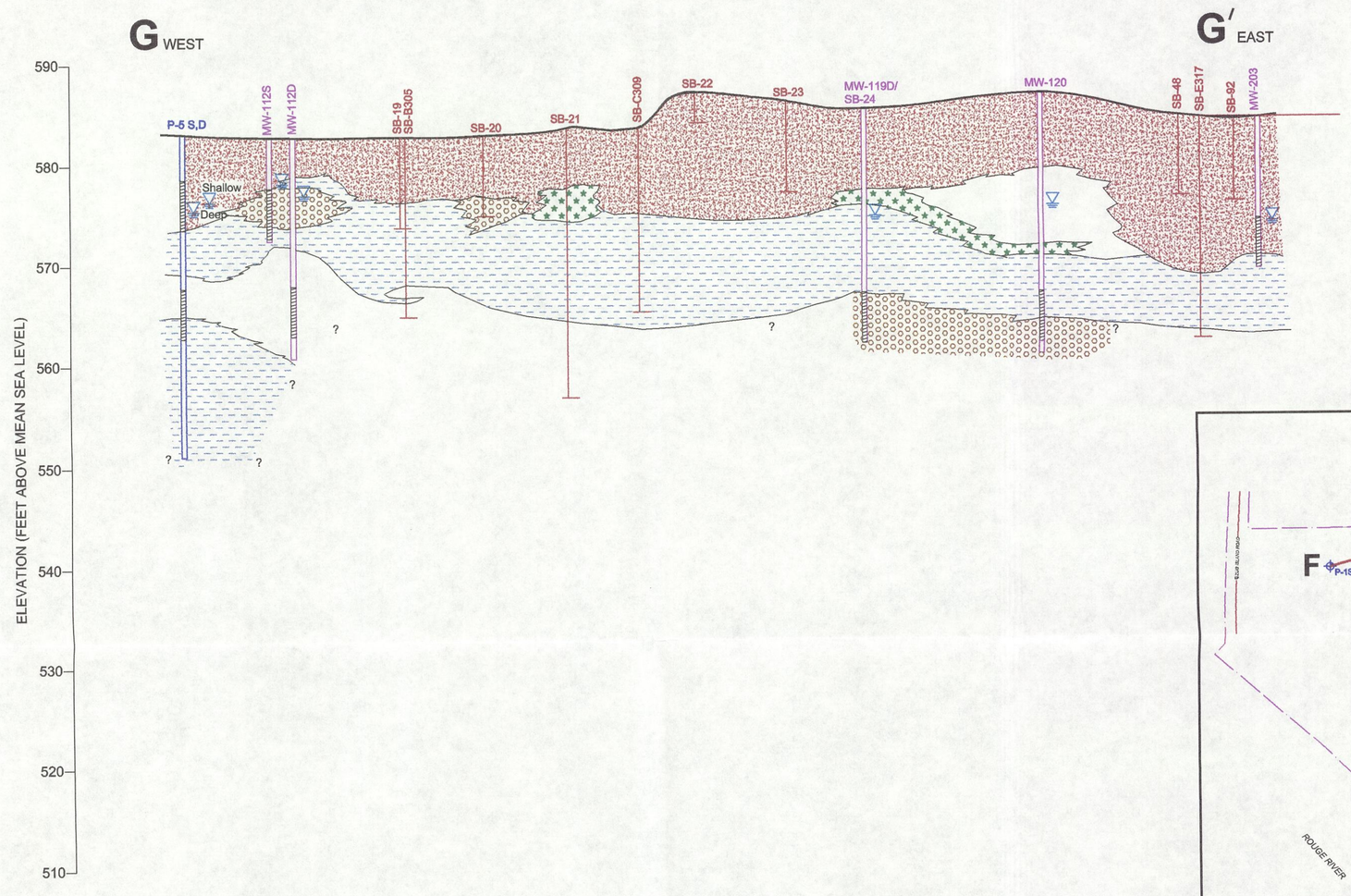
DETROIT, MICHIGAN

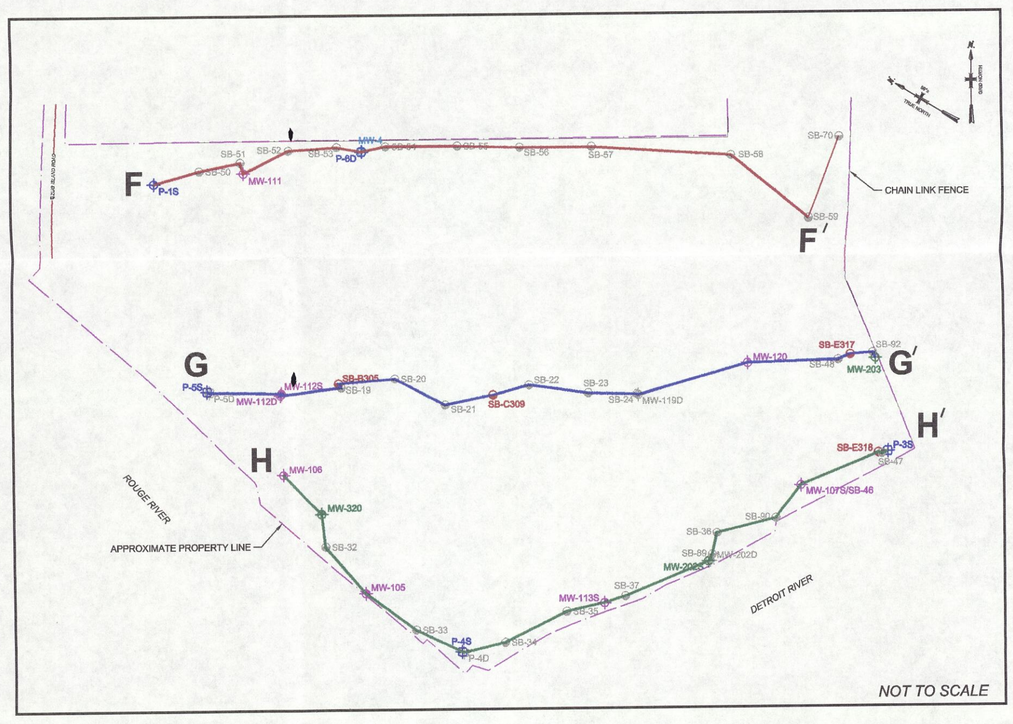
CROSS SECTIONS A - A′, B - B′, C - C′, D - D′, AND E - E′

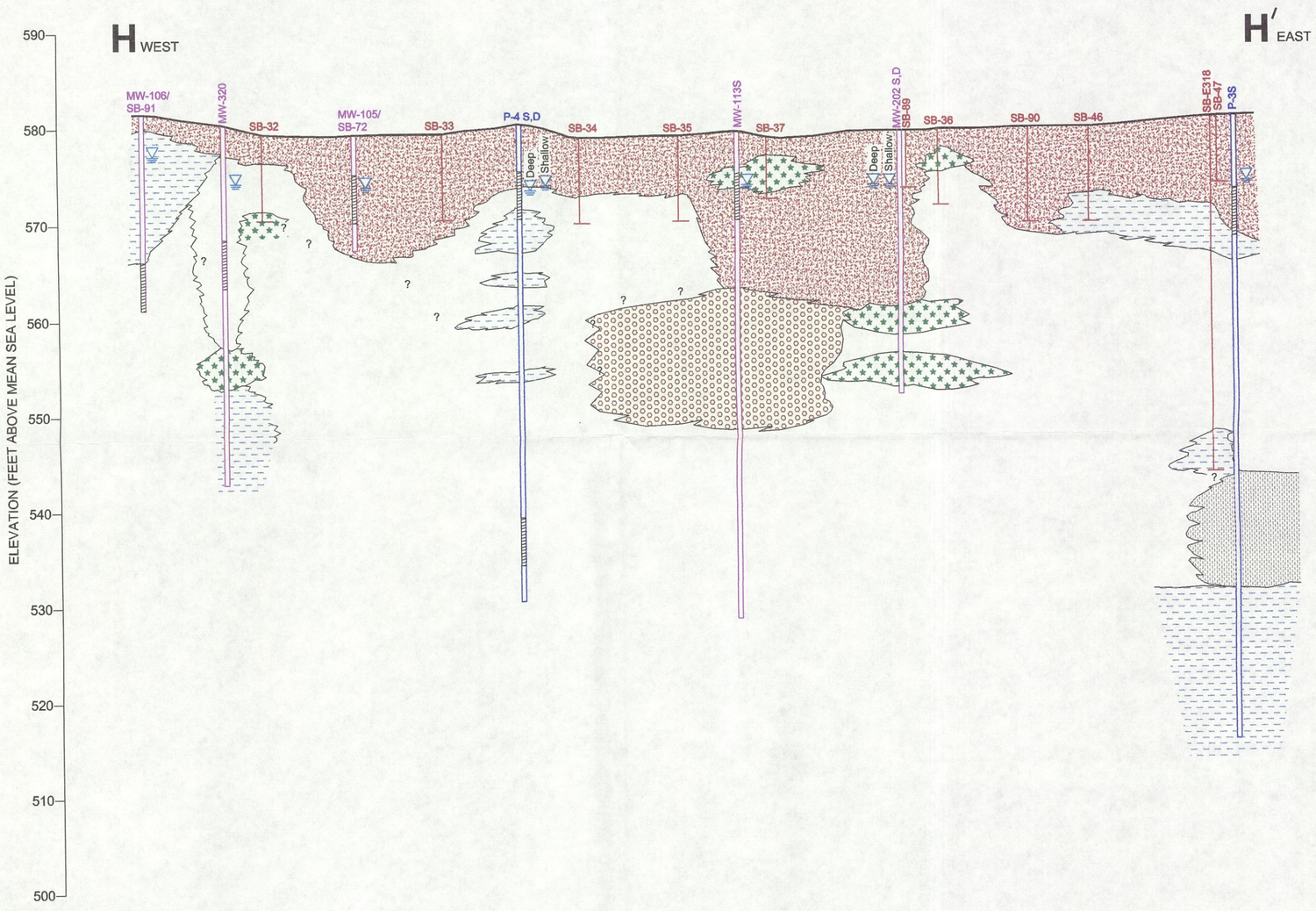
MALCOLM PIRNIE ENGINEERS, LLP
EAST LANSING, MICHIGAN

FIGURE 3-1









LEGEND

- FILL
- COARSE SAND AND/OR GRAVEL
- FINE TO MEDIUM SAND
- VERY FINE SAND OR SILT
- SANDY CLAY, SILTY CLAY, OR CLAY
- VERY FINE-GRAINED OR "OOLITIC" WHITE PASTY MATERIAL
- WATER
- PERMANENT WELL SCREEN
- WATER LEVEL

NOTE

THIS DRAWING MAY BE REPRODUCED FOR USE BY THE STATE OF MICHIGAN OR ITS AUTHORIZED REPRESENTATIVE.

HORIZONTAL SCALE IN FEET

0 200 400

VERTICAL EXAGGERATION=10x

MALCOLM PIRNIE

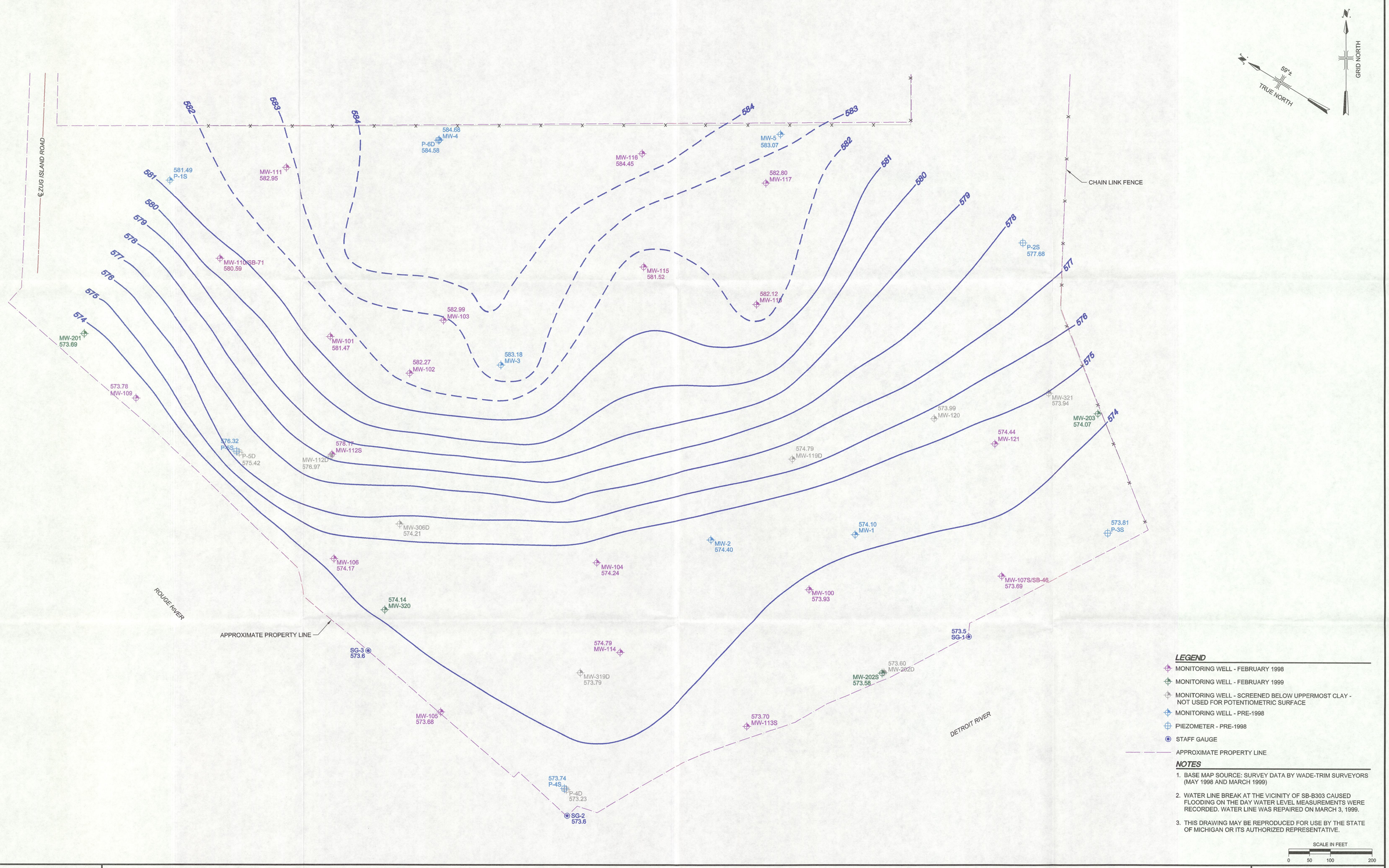
FORMER DETROIT COKE SITE

DETROIT, MICHIGAN

CROSS SECTIONS F - F′, G - G′, AND H - H′

MALCOLM PIRNIE ENGINEERS, LLP
EAST LANSING, MICHIGAN

FIGURE 3-2



LEGEND

- MONITORING WELL - FEBRUARY 1998
- MONITORING WELL - FEBRUARY 1999
- MONITORING WELL - SCREENED BELOW UPPERMOST CLAY - NOT USED FOR POTENTIOMETRIC SURFACE
- MONITORING WELL - PRE-1998
- PIEZOMETER - PRE-1998
- STAFF GAUGE
- APPROXIMATE PROPERTY LINE

NOTES

1. BASE MAP SOURCE: SURVEY DATA BY WADE-TRIM SURVEYORS (MAY 1998 AND MARCH 1999)
2. WATER LINE BREAK AT THE VICINITY OF SB-B303 CAUSED FLOODING ON THE DAY WATER LEVEL MEASUREMENTS WERE RECORDED. WATER LINE WAS REPAIRED ON MARCH 3, 1999.
3. THIS DRAWING MAY BE REPRODUCED FOR USE BY THE STATE OF MICHIGAN OR ITS AUTHORIZED REPRESENTATIVE.

SCALE IN FEET
0 50 100 200

MALCOLM PIRNIE

FORMER DETROIT COKE SITE

DETROIT, MICHIGAN

POTENTIOMETRIC SURFACE - SHALLOW WELLS - MARCH 1, 1999

MALCOLM PIRNIE ENGINEERS, LLP
EAST LANSING, MICHIGAN

FIGURE 3-3


ZUG ISLAND ROAD
CHAIN LINK FENCE
TRUE NORTH
59°±
GRID NORTH
N.
582
583
584
583
582
581
580
579
578
577
576
575
574
CN 62 A 1,900
P-1S
MW-111
CN 75 A 12,000
P-6D
MW-4
CN 360 A 98,000
CN 20 A 3,200
CN 200 A <50
MW-116
MW-5
Not Sampled
CN 390 A 2,200
MW-117
CN <10 A 1,500
MW-110/SB-71
P-2S
CN 78 A 1,100
MW-115
CN 64 A 3,900
CN 240 A 23,000
MW-118
CN 250 A 29,000
MW-103
MW-201
CN 39 A <50
MW-101
CN <10 A 140,000
CN 39 A 82,000
MW-102
CN 92 A 24,000
MW-3
CN 28 A 43,000
MW-109
CN 200 A 9,400
MW-321
CN 180 A 100,000
MW-120
CN 1,400 A 160,000
MW-121
MW-203
CN 1,000 A 8,300
CN 370 A 630
P-5S
P-5D
CN 150 A 320,000
CN 330 A 11,000
MW-112S
MW-112D
CN 180 A 18,000
CN 200 A 22,000
MW-119D
CN 300 A 56,000
MW-1
CN 280 A 67,000
P-3S
MW-306D
CN 16 A 6,900
CN 44 A 93,000
MW-106
MW-2
Not Sampled
MW-104
CN 87 A 1,500
CN 110 A 40,000
MW-107S/SB-46
CN 26 A 300
MW-320
MW-100
CN 3,200 A 27,000
ROUGE RIVER
APPROXIMATE PROPERTY LINE
CN 15 A 8,400
MW-114
CN 100 A 210,000
MW-202D
MW-202S
CN <10 A 160
MW-319D
CN 37 A 3,000
CN 48 A 3,200
MW-113S
DETROIT RIVER
MW-105
CN 21 A 1,300
CN 61 A 4,100
P-4S
P-4D
CN 57 A 6,200
LEGEND
MONITORING WELL - FEBRUARY 1998
MONITORING WELL - FEBRUARY 1999
MONITORING WELL - SCREENED BELOW UPPERMOST CLAY - NOT USED FOR POTENTIOMETRIC SURFACE
MONITORING WELL - PRE-1998
PIEZOMETER - PRE-1998
APPROXIMATE PROPERTY LINE
RED TEXT=COMPOUND CONCENTRATION EQUALS OR EXCEEDS 1000X GSI
GREEN TEXT=COMPOUND CONCENTRATION EQUALS OR EXCEEDS 100X GSI
BLUE TEXT=COMPOUND CONCENTRATION EQUALS OR EXCEEDS 10X GSI
BLACK TEXT=COMPOUNDS EQUALS OR EXCEEDS GSI
YELLOW TEXT=COMPOUND CONCENTRATION LESS THAN GSI
NOTES
1. BASE MAP SOURCE: SURVEY DATA BY WADE-TRIM SURVEYORS (MAY 1998 AND MARCH 1999)
2. DATA SOURCE: 8260+ VOC SCAN
3. MW-2 AND MW-5 NOT SAMPLED - WELLS WERE DRY.
4. THIS DRAWING MAY BE REPRODUCED FOR USE BY THE STATE OF MICHIGAN OR ITS AUTHORIZED REPRESENTATIVE.
SCALE IN FEET
0 50 100 200

User:6919 Job:2420108H73 File:i:\2420108\DWG\DCGWAD2.DWG Scale:1:100 Date:03/31/1999 Time:11:40

MALCOLM PIRNIE

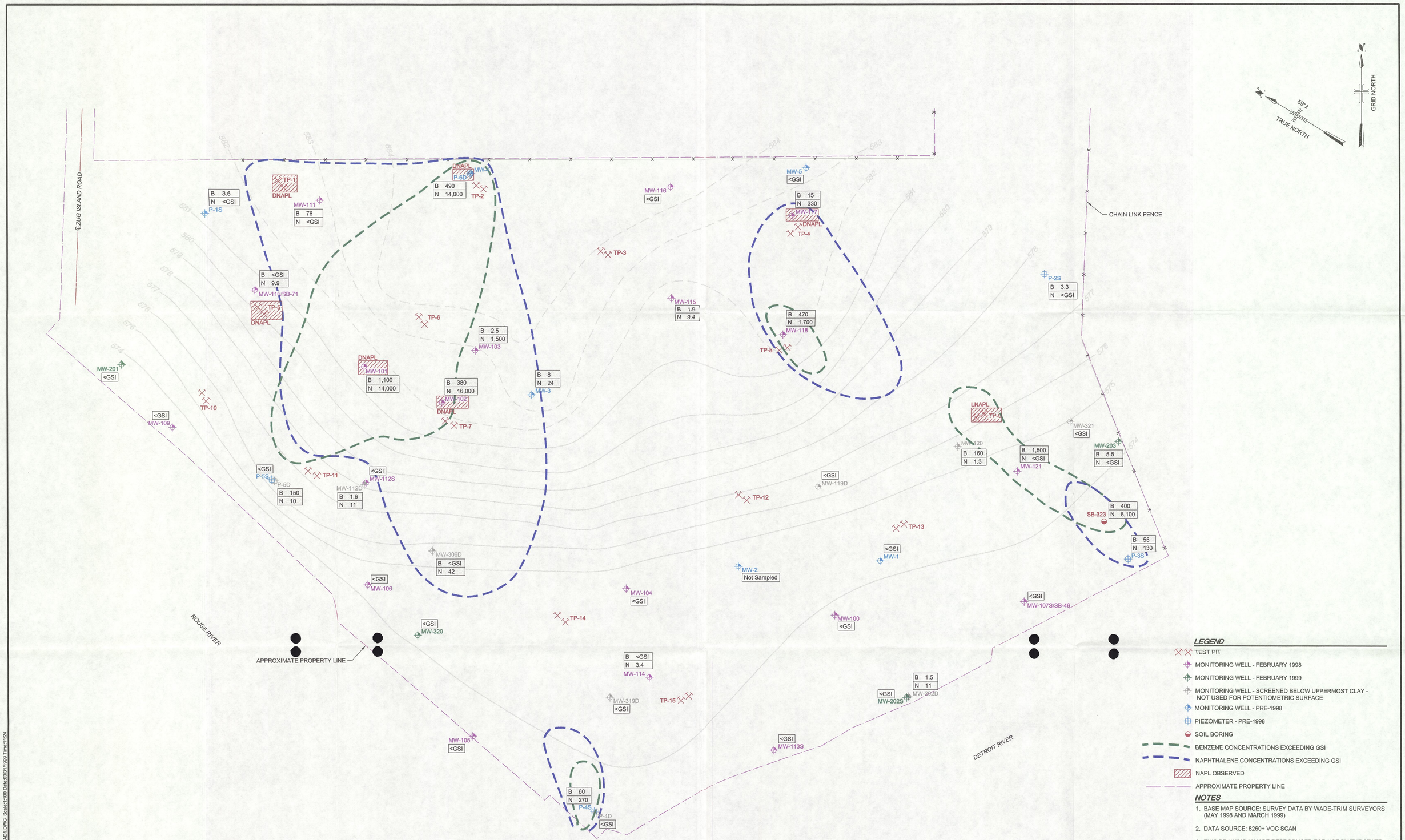
FORMER DETROIT COKE SITE

DETROIT, MICHIGAN

CYANIDE AND AMMONIA CONCENTRATIONS IN GROUNDWATER - MARCH 1999

MALCOLM PIRNIE ENGINEERS, LLP
EAST LANSING, MICHIGAN

FIGURE 3-4



LEGEND

- TEST PIT
- MONITORING WELL - FEBRUARY 1998
- MONITORING WELL - FEBRUARY 1999
- MONITORING WELL - SCREENED BELOW UPPERMOST CLAY - NOT USED FOR POTENTIOMETRIC SURFACE
- MONITORING WELL - PRE-1998
- PIEZOMETER - PRE-1998
- SOIL BORING
- BENZENE CONCENTRATIONS EXCEEDING GSI
- NAPHTHALENE CONCENTRATIONS EXCEEDING GSI
- NAPL OBSERVED
- APPROXIMATE PROPERTY LINE

NOTES

1. BASE MAP SOURCE: SURVEY DATA BY WADE-TRIM SURVEYORS (MAY 1998 AND MARCH 1999)
2. DATA SOURCE: 8260+ VOC SCAN
3. THIS DRAWING MAY BE REPRODUCED FOR USE BY THE STATE OF MICHIGAN OR ITS AUTHORIZED REPRESENTATIVE.

SCALE IN FEET
0 50 100 200

MALCOLM PIRNIE

FORMER DETROIT COKE SITE

DETROIT, MICHIGAN

BENZENE AND NAPHTHALENE IN GROUNDWATER - MARCH 1999

MALCOLM PIRNIE ENGINEERS, LLP
EAST LANSING, MICHIGAN

FIGURE 3-5

User:6919 Job:2420168H73 File:\\3420168\DWG\DCGWAD1.DWG Scale:1:100 Date:03/31/1999 Time:11:24

APPENDIX A

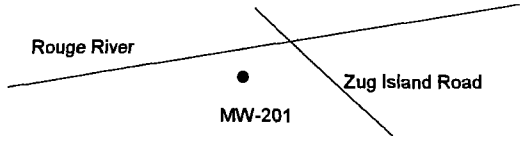
SOIL BORING AND WELL CONSTRUCTION LOGS

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-201	WELL #: MW-201	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 586.04	TOC ELEV.: 588.64	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E	1/4: 1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/25/99	END: 2/25/99		
WELL START: 2/25/99	END: 2/25/99		
WATER FIRST: ~11.5'	AT COMPLETION:		
SCREEN LOCATION: 10.3	TO: 15.3		
SCREEN TYPE: PVC	SIZE: 0.010 slot		
CASING TYPE: PVC	DIAMETER: 2"		
WEATHER: 20's, cold			
Measurements in ft bgl.			

LOCATION SKETCH (not to scale)



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
586.04									
					Brown loamy soil with root fragments				
581.04				5					
			2,2,0,1	7	6" recovery, grey soil with cinders - Fill - dry	FILL			0 ppm headspace
576.04				10					
			3,3,2,1	12	Black cinders, slag moist on bottom of shoe	FILL			0 ppm Wet at 11.5'
			3,1,1,1	14	Black gravely; cinders/slag	FILL			
586.04			2,1,1,1		Same as above	FILL			
					EOB = 15'				
					MW-201 Installed				
566.04				20					
561.04				25					
556.04				30					
551.04				35					
546.04				40					

LEGEND: TOPSOIL SAND CLAY FILL GRAVEL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-202	WELL MW-202D	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 579.17	TOC ELEV.: 582.30	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING STAR 2/23/99	END: 2/23/99	LOCATION SKETCH (not to scale)	
WELL START: 2/26/99	END: 2/26/99		
WATER FIRST: 7'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: cloudy, 20's			
Measurements in ft bgl.			

ELEV. FT	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
579.17									
					Fill, black, gravel, cinders	FILL			
					Hard concrete? @ 4'				
574.17				5					
			6,30,0	7	No recovery fill (?)	FILL			
			1,0,1,1	9	Wet angular gravel	FILL			
579.17			2,1,1 (12")	11	Same as above with sand (2" recovery)	FILL			
			1,1,1,1	13	Minimal recovery - attempt 3" spoon Empty spoon				
	3" spoon		1,1,2,2		Gravel in spoon				
564.17	3" spoon		6,3,2,2	15	Minimal recovery				
			3,1,1,1	17	3" recovery - gravel and sand	FILL			
			1,1,1,1	19	Brick, black gravel - sheen	FILL			
					18' - white fine grained material	ML			15" recovery, odor
579.17			1,1 (18")	21	White pasty - silty material				3" recovery
			Wt. of rods	23	Grey, clayey medium sand - odor	SC			
			Wt. of rods	25	Soft - marl-like (pastey) material - grey	ML			
554.17									
			Wt. of rods	27	Marl material to 26.5'				
					26.5' - grey silty clay - soft	CL			
					EOB = 27'				Temp well 15'-20'.
579.17									
579.17									
579.17									

LEGEND: TOPSOIL SAND CLAY SILT FILL

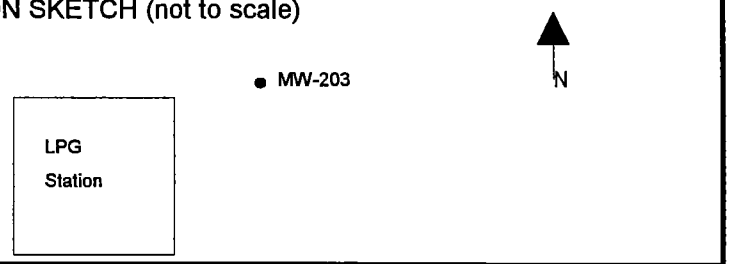
NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # 203	WELL #: MW-203	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 584.32	TOC ELEV.: 587.05	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING STAR 2/17/99	END:		
WELL START:	END:		
WATER FIRST: ~10.5'	AT COMPLETION:		
SCREEN LOCATION: 9'	TO: 14'		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~ 35, cloudy			
Measurements in ft bgl.			

LOCATION SKETCH (not to scale)



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
584.32									PID screening every 6"
					Black topsoil and gravel fill	FILL			over spoons
579.32				5					
			2,2,1,1		Dry - moist black angular cinder/slag and asphalt fill	FILL			0,0 0,0 1.5/2.0
			3,2,1,1		Same as above increase silt content	FILL			0,0 0,0 2.0/2.0
574.32				10					
			5,7,7,3		Same as above wet	FILL			0,0 Well set 0,0 2.0/2.0 9'-14'.
			2,1,1,0		Same as above	FILL			0,0
569.32				15	Clay low plasticity sticky silty	CL			0 1.5/2.0
					EOB = 15'				
564.32				20					
559.32				25					
554.32				30					
549.32				35					
544.32				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

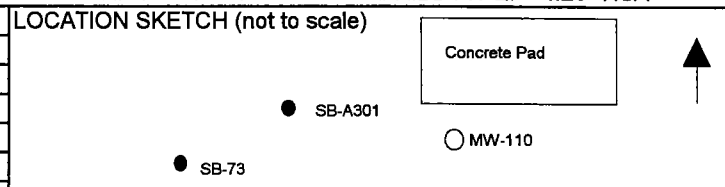
NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-A301	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 583.73	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING STAR 2/11/99	END: 2/11/99		
WELL START:	END:		
WATER FIRST: ~3'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: Sunny, T ~ 50			
Measurements in ft bgl.			

LOCATION SKETCH (not to scale)



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
583.73									
578.73				5	Asphalt ~2-3" Black fill, gravely sand with slag - coal - concrete Fill to ~ 7' bgl	FILL			Concrete at ~ 6" perched water at ~ 3' slight odor
573.73	DC-SBA-301 8-10'		1,1,2,3	10	Grey, silty clay, very soft, moist, brown mottling	CL			15" recovery
			1,1,1,1	12	Same as above				
			0,1,2,2	14	Same as above				
568.73					EOB = 14'				
563.73				20	Grouted to surface with bentonite slurry 35 gallon/ 1 bag mix Baroid, 1 bag dry on top				Headspace 8-10 PID = 6.0 10-12 PID = 8.0 12-14 PID = 7.0
558.73				25					
553.73				30					
548.73				35					
543.73				40					

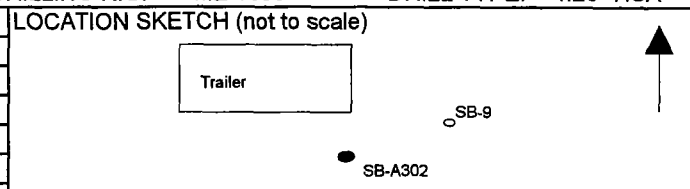
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-A302	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 582.20	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING STAR 2/11/99	END: 2/11/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: ~2.5'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: Cloudy, T ~60			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
582.2									
				4	Fill black, gravely water at ~2.5' with coal cinders	FILL			
577.2			2,1,1,2	6	Wet, black, gravely sand with coal/slag frags	FILL			8" recovery
			0 weight of hammer	8	No recovery				No discernable odor
572.2			0 weight of hammer	10	Minimal recovery - slop/fill				
	DC-SB-A302 (10')		0-18" 1-6"	12	8" recovery fill on top Grey silty clay	CL			
			1-12" 1-12"	14	Moist silty sandy clay - dk grey with abundant root structures med-high plasticity, soft	CL			
567.2			0-18" 1-6"	16	No recovery				
			0-18" 3-6"	18	Grey silty clay with some sand grades to sandy clay. At 17.8' light grey clayey sand, stringer at	SC			18" recovery
			1,2,2,2,		bottom. 18-19' lt. grey, wet, fine sand well sorted	SP			18" recovery
562.2				20	19-20' grey silty clay low plasticity	CL			
					EOB = 20' 40 gallons-grout (2 bags of Baroid) to abandon borehole				
557.2				25					
552.2				30					
547.2				35					
542.2				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-A302D	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 582.20	TOC ELEV.:	LOGGED BY: Dan Bremer/Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: Dennis Giffels	DRILLING RIG: CME 95/1050	DRILL TYPE: 12.25/4.25
BORING START: 2/16/99	END: 2/25/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~30, cloudy			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
582.2									
									12.25" HAS to 14 bgl
577.2				5	Same as SB-A302				Set 14.5' of 10" steel casing
									11.5-14' Shelby Tube sample
572.2				10					
					Grey silty clay - soft	CL			Pushed casing 0.5' into clay, grouted with bento-nite/cement grout, 12-bags cement, 1 bag bentonite.
				14					
567.2			1,0,1,1	15	16" recovery, gray sandy clay - soft - root frags	CL			
									VAS DC-302D (15-20')
562.2				20					PID every 6" over spoons
			1.3.2.3		1' recovery gray silty clay firm low plasticity moist tight	CL			0,0, 0,0, 1.0/2.0
					1' recovery gray silty clay low plasticity sticky	CL			
557.2			1,1,1,1	25	Moist - very moist	CL			0 0 1.0/1.0
			1,1,1,1		Silty gray clay low-non-plastic, trace coarse	CL			0
552.2				30	sand moist-very moist				0 2.0/2.0
			2,1,1,1		Same as above	CL			0,0
547.2				35					0,0 2.0/2.0
			0,0,0,0		Same as above with blue gray silty clay 1" lenses Moist with 1" coarse sand, lens moist	CL			0,0 0,0 2.0/2.0
542.2				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # 302D	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
			0,0,0,0		Silty gray clay moist with blue gray bands ~ 2" thick	CL			0,0 2.0/2.0 0,0 very sticky
537.2				45					
			1,1,1,2		Same as above with trace of sand	CL			0,0 0,0 2.0/2.0
532.2				50					
			Rod Dropped		Same as above less moisture, stiffer than above	CL			0,0 0,0 2.0/2.0
527.2			No blow counts recorded	55					
			2,2,2,3		Same as above soft-firm clay gray , moist dark gray banding ~ 1" thick	CL			0,0 0,0 2.0/2.0
522.2			Rod Weight	60	Same as above very moist trace fine gravel	CL			Spoon rods wet 0,0 0,0 2.0/2.0
				65	EOB = 62'				
				70					
				75					
				80					
				85					
				90					

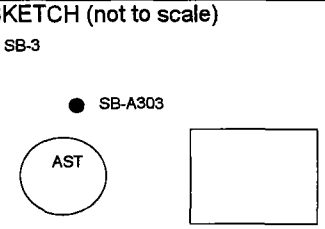
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES:

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-B303	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 585.02	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING STAR 2/12/99	END: 2/12/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: ~2'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~30, cloudy, cold			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
585.02									
					Black, gravely fill w/ slag, brick - wet at ~2'.				
580.02			8,3,2,0	5	Fill, concrete, slag, brick frags	FILL			PID at borehole = 0 ppm 12" recovery slight odor
	DC-SBA-303		0,0,0,3		Fill, ss frag/coal/brick	FILL			8" recovery
	(8')			8	8-9.7' wet, brown, fine sand, black at 9.4 - 9.7'	SP			
			10,7,4,3						18" recovery, 0 ppm
575.02				10	9.7' grey sandy clay, soft, moist	CL			
			4,2,2,2		Light grey, silty clay, moist, soft, high plasticity	CL			15" recovery
			2,2,1,2		Light grey, silty clay	CL			16" recovery, 0 ppm
570.02			1,2,2,3	15	Same as above	CL			20" recovery
					EOB = 16'				
565.02				20	40 gallon - bentonite slurry to abandon borehole (2 bags Baroid bentonite)				
560.02				25					
555.02				30					
550.02				35					
545.02				40					

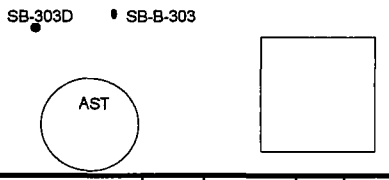
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-B303-D	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 585.02	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: Dennis/John	DRILLING RIG:	DRILL TYPE: 12.25"/4.25"
BORING STAR 2/18/99	END: 2/22/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~30, light snow			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
585.02									
					Same as SB-B303				Drilled to 12' witb 12.25" HSA. 10" steel casing set to 13.5 bgl. Grouted in place with bentonite-cement (12 bags)
580.02				5					
575.02				10					10-12.5' Shelby Tube - full recovery
570.02				15					
			2,2,1,2		Grey, soft, medium plasticity silty clay	CL			18" recovery
565.02				20					
			1,1,0,1		Soft, sticky, grey, silty clay	CL			22" recovery
560.02				25					
			1-12" 1,1		Same as above with 5% fine gravel	CL			20" recovery
555.02				30					
			0,1,1,1		Same as above	CL			
550.02				35					
			Weight of hammer		Same as above	CL			
545.02				40					

LEGEND: TOPSOIL SAND CLAY SILT GRAVEL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-B303D	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
			Wt. of hammer		Soft, sticky, grey silty clay	CL			
540.02				45					
					Same as above	CL			
					EOB = 47'				Borehole abandoned with bentonite slurry ~ 80 gallons (4 bags)
535.02				50					
530.02				55					
525.02				60					
				65					
				70					
				75					
				80					
				85					
				90					

LEGEND: TOPSOIL SAND CLAY SILT GRAVEL

NOTES:

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-B304	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 581.60	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/12/99	END: 2/12/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: ~4'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: cloudy, cold. 30's			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
581.6									
					Concrete - Limestone frags	FILL			
576.6			1-12"	5	Fill - silty clay with limestone frags	FILL			11" recovery sheen on water @ ~4.2'
			2,8,1,1		Grey sandy clay with gravel	CL			12" recovery
571.6			1,1,1,1	10	No recovery - sand in spoon	CL			petro odor
			1,1,1,1		Grey, silty clay, moist, soft, high plasticity. 12-12.5 - silty, clay	CL			15" recovery, odor
	DC-SBB304 (12.5')		2,3,3,3		12.5 - 14' fine to medium well sorted sand - grey with black staining - sheen - odor	SM			
566.6			6,7,3,3	15	Grey - medium - well sorted sand - wet	SM			18" recovery, odor
			5,5,4,5		Grey - fine to medium sand moderately rounded, wet	SM			
561.6			1-12" 1-12"	20	Same as above	SM			10" recovery
					EOB = 20' Borehole abandoned with bentonite slurry.				Headspace 4-6 PID = 22ppm 6-8 PID = 16ppm 10-12 PID = 17ppm 12-14 PID = 110 ppm
556.6				25					
551.6				30					
546.6				35					
541.6				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-B305	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 582.20	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING STAR 2/12/99	END: 2/12/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: ~2'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: Cloudy, cold, 30's			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
582.2									
				4	Black - fill - concrete - slag	FILL			Wet at 2'
577.2	DC-SBA305 (6')		2,1,1,7	6	Black, fill - slag, gravel, wood frags stained petroleum odor, sheen	FILL			
			7,3,1,1	8	6-6.5' wood/slag, 6.5-8' Grey - clayey sand/sandy clay, damp	CL			12" recovery
572.2			2,1,1,1	10	0 recovery				
			2,2,1,1	12	0 recovery, try 3" spoon - grey sandy clay with brown mottling wood frag structures	CL			
			1,1,2,2	14	Grey sandy clay with trace gravel - wood structures	CL			12" recovery
567.2			0,1,1,1	16	12-14.7' Grey sandy clay 14.7' Sand, brown fine wet well sorted no sheen	CL SM			20" recovery
			0-18" 2-6"	18	16-16.5' - Sandy clay 16.5-18' Fine light brown well sorted sand	CL SM			
562.2				20	EOB = 18' Abandon borehole with bentonite slurry.				PID 4-6 = 3ppm 6-8 < 1ppm 8-10 < 1ppm 10-12 < 1ppm 12-14 < 1ppm
557.2				25					
552.2				30					
547.2				35					
542.2				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-B306	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 583.25	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING STAR 2/12/99	END: 2/12/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: None	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: Cloudy, cold ~ 30, windy			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
583.25					Asphalt				
				4	Black, gravely fill with slag frags, concrete - cinders	FILL			
578.25			5,5,4,1	6	Black cinders/ss gravel - dry 5.5' grey clayey sand - moist	FILL			18" recovery no odor
	DC-SB-B306 (8')		2,1,2,1	8	Fill, gravel with cinders - dry	FILL			9" recovery
573.25			2,1,2,1	10	8-8.3' Fill - cinders. 8.3-10' grey organic rich (peat), silty clay with fine sand stringers - damp	CL			22" recovery
			2,2,1,2	12	10-10.5' Moist, silty clay - soft, 10.5-10.8' black organic peat layer,10.8-12'grey silty clay soft moist	CL			18" recovery
			3,2,1,2	14	12-14' grey - silty clay, soft, high plasticity root structures trace of sand	CL			12" recovery no odor
568.25					EOB = 14' Dry hole Abandoned with bentonite hole plug - 5 bags hydrated				PID - Headspace 4-6 2.2ppm 6-8 8.8 ppm 8-10 4.6 ppm 10-12 4.0 ppm
563.25				20					
558.25				25					
553.25				30					
548.25				35					
543.25				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-B306-D	WELL #: MW-306	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 583.25	TOC ELEV.: 586.50	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E	1/4: 1/4:
DRILL CO.: Stearns	DRILLER: Dennis	DRILLING RIG:	DRILL TYPE: 4.25" HSA
BORING START: 2/17/99	END: 2/17/99	LOCATION SKETCH (not to scale)	
WELL START: 2/25/99	END: 2/25/99		
WATER FIRST: 14.3'	AT COMPLETION:		
SCREEN LOCATION: 18	TO: 23		
SCREEN TYPE: SS	SIZE: 2" (0.010)	B-306-D	
CASING TYPE: Galv.	DIAMETER: 2"		
WEATHER:		B306	
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
583.25									
					Same as B306				12.25" HAS to 12' bgl 10" steel casing 0-12' pushed 12' into clay 11 bags of cement PID every 6" over spoons
578.25				5					
				9.5					
573.25				10	Grey silty clay in bottom of tube	CL			9.5-12' Shelby Tube
									VAS DC-306-I (12-17') 0,0
568.25			1,2,1,1	15	Wet silty clayey coarse sand Gray loose at 14.3' with ~ 4" clay lenses	SC			0,0 2.0/2.0 0 black, fine
			2,3,5,7		Wet fine sand with little fine gravel loose dark gray some black material	SM			0,0 1.5/2.0 gravel mat.
563.25			1,2,3,2	20	Fine sand wet dark gray loose Coarse sand wet angular loose dark gray	SM			0 ~ 5' sand 0,0 1.75/2. heave
				23	Change in rig feel at 23'				VAS DC-306-D (19-24') sound change in rig
558.25			0,0,0,1	25	Light gray soft sticky moist clay	CL			0 0 1.0/2.0
									Temp well set at 24.5'
553.25				30					
548.25				35					
543.25				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: *bgl - below ground level*

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-C307	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 588.41	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/12/99	END: 2/12/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: ~3'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: *cloudy, windy , upper 20's*			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
588.41									
583.41				6	Fill - black, gravely	FILL			Wet at ~ 3'
			3,2,1,1	8	Wet, gravely fill, black coal/slag fill - frags				Slight odor
578.41	DC-SBC307-10		1,1,2,1	10	8-9.5' SAA 9.5-10' Brown, *medium-coarse sand/gravel, wet*				
			5,3,5,6	12	10-11.8' Brown, poorly sorted fine-coarse sand, 10% Gravel, wet, no odor	SM			
			3,4,4,4	14	11.8 Brown silty clay - low plasticity - medium stiff. Grey silty clay at 12' - moist, medium stiff	CL			
573.41			1,2,2,2	16	medium plasticity Soft moist, grey silty clay medium plasticity	CL			
568.41				20	EOB = 16' Abandoned with 6 bags of hydrated Baroid hole plug.				PID Headspace 6-8 0 ppm 8-10 3.2ppm 10-12 3.8 ppm 12-14 3.2 ppm
563.41				25					
558.41				30					
553.41				35					
548.41				40					

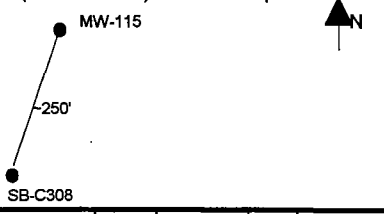
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-C308	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 584.52	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/15/99	END:	LOCATION SKETCH (not to scale) See Map	
WELL START:	END:		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~ 30, clear-partly cloudy			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
584.52									PID = Recovery
					Fill				
					Black gravely cindery fill	FILL			0 No odor
579.52				5	Black asphalt and gravel fill - black stained	FILL			Screen every 6" of spoon samples with PID
	DC-SBC-308	10:55	3,1,2,2		Same as above moist				0,0
574.52	(8')			10	Black stained low plasticity silty clay very moist	CL			0,0 2.0/2.0
			2,1,1,1		Black sandy silty clay very moist	CL			0,0 no odor
									0,0 2.0/2.0
			1,0,1,1		Same as above with clayey silt seams and peat	CL			0
					seams about 1" thick moist-dry				0 1.0/2.0
569.52			0,0,1,2	15	Black low-non plasticity clay sticky	CL			0
					Grey non-plastic clay	CL			0 2.0/2.0
			1,1,2,1		Same as above with sandy clay stringers very	CL			0
					moist. 3" of wet sand at tip	SM			0,0 1.0/2.0
			0,0,1,1		Wet medium sand grey angular loose	SM			0,0
564.52				20					0,0 2.0/2.0
					EOB = 20'				
					Tremmie grouted hole with bentonite slurry				
					1 bag of bentonite granules, 1 bag of hole plug				
559.52				25	~ 30 gallons of grout				
554.52				30					
549.52				35					
544.52				40					

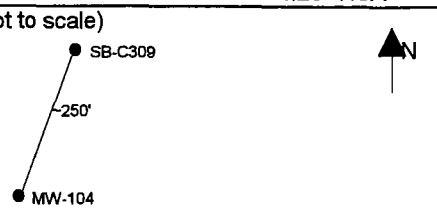
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-C309	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 583.16	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/15/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: none	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~35, sunny-partly cloudy			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
583.16									PID = Recovery
578.16				5	Black medium sand sized cindery material dry (Fill)	FILL			PID screened every 6" over spoons 0 over cuttings (oc)
573.16	DC-SB-C-30 8-10'	12:45	0,1,0,4	10	Gravely silty non-plastic clay black very moist 8.5'	FILL CL			0,0 1.5/2.0 0,0 no odor
			5,4,3,5		Hard brown gravely clay with sand moist-dry mottled appearance	CL			0,0 2.0/2.0 0,0 no odor
			1,0,0,0		Black very soft clay ~10% silt very moist and sticky	CL			0,0 0.5/2.0 0,0 no odor
568.16			0,0,0,1	15	Same as above black	CL			0,0 0.5/2.0 0,0
			1,2,2,1		Same as above with 3" silt stringers gray	CL			0,0 2.0/2.0 0,0
563.16				20	EOB = 18' Tremmie grout hole with bentonite slurry 1 bag chips, 1 bag granules, ~35 gallons				
558.16				25					
553.16				30					
548.16				35					
543.16				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-C310	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 583.30	TOC ELEV.: x	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START:	END:		
WELL START:	END:		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: Temp ~ 35, sunny, light breeze north			
Measurements in ft bgl.			

LOCATION SKETCH (not to scale)

ELEV. FT	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS,
583.3									PID = Recovery
					Fill asphalt 0-6"				Logged PID at 6" intervals
					Black cindery sandy fill material with sheen	FILL			over spoons
									0 over cuttings
578.3				5					
									18 over cuttings
			5,2,2,1		Sand and gravel loose gray dry-moist angular	SM			8.0 0.5/2
573.3				10					0
			3,3,4,2		Poor recovery sand in tip	SM			? 0.0/2
	DC-SB-C-310 12-14'	14:00	4,1,2,2		Sand and gravel	SM			0,0 0.0/2 3" spoon
					Sandy silty clay dark gray	CL			0,0
568.3			0,0,0,0	15	Sandy (~15%) clay dark gray low plasticity moist very soft				3" spoon
									0,0 1.5/2 no odor
			1,0,1,0		Clay gray with ~ 20% coarse sand light gray very moist clay	CL			0,0 2.0/2.0
									0,0
					EOB = 18'				
563.3				20					
					Tremmie grout hole with bentonite slurry ~ 40 gallons, 2.5 bags of powdered bentonite				
558.3				25					
553.3				30					
548.3				35					
543.3				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

WELL / BORING LOG

BORING #: SB-D311	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 589.86	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/23/99	END: 2/23/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 5'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: cloudy, 20's			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
589.86									
584.86				5	Black, fill, gravely cinders	FILL			Wet at 5' bgl
			4,3,1,1	8	No recovery				
579.86			1,1,1,1	10	Black fill, cinders, sand slag, wet, gravel	FILL			odor, 12" recovery
	DC-D311-12		2,2,1,1		Same as above	FILL			PID = 17.0 ppm headspace, strong odor
			1,1,1,1		Same as above - sheen	FILL			PID = 0 ppm headspace
					Grey silty, soft clay at 13.5'	CL			
574.86			1,1,1,1	15	Grey, silty soft clay - 18" recovery	CL			
569.86				20					
			1-12" 1-12"		Grey, sticky clay, soft low plasticity, 18" recovery	CL			
564.86				25					
			Wt. of rods		Same as above, 22" recovery	CL			
559.86				30					
			Wt. of rods		Same as above, 22" recovery	CL			
554.86				35	EOB = 32' Abandoned borehole with bentonite slurry.				
549.86				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-D312	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 585.77	TOC ELEV.: x	LOGGED BY:	Ken Ewers/Dan Bremer
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S	R: 11E 1/4: 1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/15/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST:	AT COMPLETION: x		
SCREEN LOCATION: x	TO: x		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~40, sunny			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
585.77									
					Fine gravel taconite fill	FILL			PID screening every 6" over spoons 0 ppm over cuttings
580.77				5	Softer				0 ppm over cuttings
			3,2,1,1		Black cinders and medium sand sized fill, moist	FILL			0,0 0.5/2.0 0,0
575.77			1,2,2,1	10	Same as above, moist	FILL			0,105 0.5/2.0 90, 8.5 no odor
			1,2,1,1		Same as above, coarse sand sized, very moist	FILL			0,0 1.0/2.0 0,0
			3,4,4,5		Same as above, wet	FILL			0,0 1.0/2.0 0,0
570.77	DC-SB-D312 (14-16')	15:30	1,0,1,1	15	Gray, soft, low plasticity clay at 14.2'	CL			0,0 2.0/2.0 0,0
			1,0,1,1		Gray, soft non-plastic clay with peat lenses	CL			0,0 2.0/2.0 0,0
			1,0,2,2		Same as above, grading to medium sand brown	CL			0,0 0/2.0 (2" spoon)
565.77				20	Sand at 19'	SM			0,0 2.0/2.0 (3" spoon)
			1,0,1,1		Clayey silty yellow-brown sand, wet	SM			0,0 1.0/2.0 0,0
					EOB = 22'				
560.77				25	Tremmie grout with bentonite slurry - 2 bags of powder				Note: 2/26/99 Shelby Tubes attempted at D312-D2 twice. D312-D3 two Shelby Tubes collected at 15-17' and 17-19'.
					D312-D2 and D312-D3 also tremmie grouted with bentonite slurry (2 bags in each borehole				
555.77				30					
550.77				35					
545.77				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-D312-D	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 585.77	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/23/99	END: 2/24/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 5'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: cloudy, 20's			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
585.77									
					Same as D312				12.25" HAS to 15'
585.77									10" steel casing from grade to 16.5'
585.77									
570.77			1,1,1,1	15	Grey, soft, silty clay	CL			
					Peat lens ~2" at 15.5'				
565.77				20					
			1,1,1,1		Grey clayey sand/sandy clay - moist, 18" recovery	CL			PID = 0 ppm headspace
			1,1,1,1		Grey, well sorted, wet fine-medium sand loose, 18" recovery	SM			PID = 0 ppm headspace
560.77			0,1,0,1	25	SAA, 16" recovery	SM			PID = 0 ppm headspace sand heave
			1,3,2,1		Grey, wet, coarse to medium coarse sand, wet Fine sand in bottom of shoe, 22" recovery	SM			6' of heave, bailed augers
555.77			1-24" pushed	30	2" spoon - no recovery - clay on sides 3" spoon - grey, sticky clay - soft	CL			Full recovery
					EOB = 30'				
550.77				35	Abandoned with bentonite slurry				
545.77				40					

LEGEND: TOPSOIL SAND CLAY SILT GRAVEL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-D313	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 582.95	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/15/99	END: 2/15/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 5'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~40 sunny, partly cldy			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
582.95									
					Black, cinders, gravel	FILL			PID screening every 6" over spoons
582.95				6		FILL			Wet at 5'
				8					
572.95				10					
			2,2,1,2		Black, gravely fill with abundant slag frags, wet	FILL			15" recovery
	DC-SB-D313			12					PID = 0
			2,2,1,2		Black gravely fill	FILL			20" recovery
				14	Black, clayey sand grades to sandy clay, moist	CL			PID = 0
582.95			2,2,1,2		Grey, organic rich silty clay - low plasticity with				12" recovery
				16	root/wood frags at 15.5'-16' peat zone	CL			PID = 0
			1,1,1,2		Grey silty clay moist low-non plastic	CL			12" recovery
				18					
			1,1,1,2		Grey silty clay grades to sandy clay at 18.5' then	CL			20" recovery
562.95				20	to clayey sand at 19.7'	SM			
			1,1,1,2		Light grey poorly sorted fine-medium sand with	SM			
				22	some clay - wet - more clay in bottom of spoon	CL			
					EOB = 22'				
557.95				25	Borehole abandoned with bentonite slurry.				
552.95				30					
547.95				35					
542.95				40					

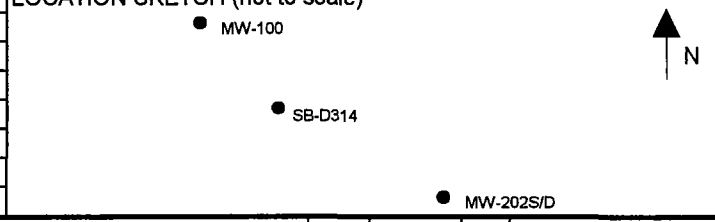
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-D314	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 580.14	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/16/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~40, cloudy, light rain			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
580.14									
					Gravel fill	FILL			PID screen every 6" over spoons
575.14				5		FILL			0 - over cuttings
			4,3,5,10		Wet coarse sand sized black cinders and slag				0,0 1.5/2.0
570.14				10	with sand fill	FILL			0
	DC-SB-D314 (10-12')	16:45	5,3,2,1		Same as above	FILL			0,0 2.0/2.0
					Gray black low plasticity clay	CL			0,0
			4,2,2,1		Gray black low plasticity clay with fine sand				0,0 2.0/2.0
					seams ~2" thick	CL			0,0
565.14			2,2,3,2	15	Same as above	CL			0,0 2.0/2.0
					Medium-coarse sand angular wet	SM			0,0
					EOB = 16'				
560.14				20	Tremmie grout hole with bentonite slurry, 2 bags powder to ~40 gallons				
555.14				25					
550.14				30					
545.14				35					
540.14				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-D314-D	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 580.14	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: Dennis	DRILLING RIG:	DRILL TYPE: 4.25" HAS / 12.25"
BORING START: 2/18/99	END: 2/26/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 16'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: cloudy, 20's			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
580.14									
					Same as SB-314				12.25" HAS to 12'
									10" steel casing set to
									12.5', attempted Shelby
575.14				5					Tube - rock in tube poor
									recovery
570.14				10					
					Sandy clay/clayey sand grey, moist, soft	SC			
565.14				15					
			0,1,1,2		Light brown/grey, poorly sorted fine-medium	SP			VAS sample DC-314-S
					sand with 10% coarse sand, subangular - wet				(15-20')
560.14				20					
			0,1,1,1		Grey, moderately sorted fine-medium sand	SP			
					with 5% coarse sand - wet sub rounded				
555.14			1,2,2,3	25	Light brown, well sorted fine sand - wet	SP			
			0,0,2,2		28-29' Fine brown sand	SM			
550.14				30	29-29.5 Coarse sand	GP			
			1,1,1,2		29.5-30' Grey clayey silt,	ML			
					30-32' Grey, fine, well sorted sand - wet	SP			VAS sample DC-314-I
545.14			0,1,3,2	35	34-34.5' fine sand	SP			(30-35')
					34.5-36' fine silty sand with tight clay	SC			
			0,0,0,3		Fine sand with tight clay stringers - grey	SC			
			0,0,1,2		Fine-medium well sorted sand	SP			
540.14				40					

LEGEND: TOPSOIL SAND CLAY SILT GRAVEL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # D314-D	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
535.14				45					VAS sample DC-314-D (42-47')
			0,1,1,1		Fine well sorted grey sand	SM			24" recovery
530.14				50					
			0,0,0,1		Same as above	SM			
					Change in lithology				
525.14			0,0,3,4	55	Light grey, medium stiff, moderate plasticity, clay, tight sand/gravel	CL			24" recovery
520.14				60	EOB = 57'				
					Abandonded borehole with bentonite slurry after temp well removed on 2/26/99.				
				65					
				70					
				75					
				80					
				85					
				90					

LEGEND: TOPSOIL SAND CLAY SILT GRAVEL

NOTES:

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E315	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 585.46	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/16/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:	SB-E315 30' P-25 N	
WATER FIRST: 10.25'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T~35, sunny, calm			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
585.46									
					Fill black cinders and slag medium sand sized	FILL			PID screening every 6" in spoons
580.46				5					
				8					
			4,6,12,12		Coarse wet cinders and slag coarse sand	FILL			0,0 1.75/2.0
575.46				10	sized, hard				0,0 no odor
	DC-SB-E315 (10-12')	09:00	3,5,3,2		Same as above wet	FILL			0,0 1.75/2.0
				12	Gray clay low-non plastic at 11.5'	CL			0,0 no odor
			1,1,1,1		Clay low plasticity gray-brown soft				0,0 1.5/2.0
				14		CL			0,0 no odor
585.46			1,0,1,2		Clay low-non plastic very soft trace silt				0,0 1.5/2.0
				16	brown-gray	CL			0,0
					EOB = 16'				
565.46				20	Tremmie grout hole with bentonite slurry ~ 40 gallons of grout 2 bags of powdered bentonite				
560.46				25					
555.46				30					
550.46				35					
545.46				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E316	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 585.51	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/16/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 9.5'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~40, sunny, N ~5mph			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
585.51									
					Fill black medium sand sized cinders and slag	FILL			PID every 6" over spoons
580.51				5					0 over cuttings
				8					
			2,2,1,1		Coarse sand sized cinders and fine gravel				0, 1.5/2.0
575.51				10	angular very moist - wet	FILL			0,0
	DC-SB-E316 (10-12')	10:20	3,2,1,1		Same as above	FILL			0,0 2.0/2.0
				12	Gray low-non plastic moist clay	CL			0,0
			1,1,1,1		Dark gray low plasticity sticky clay moist ~5%	CL			0 1.5/2.0
				14	silt				0,0
585.51			1,0,1,0		Light gray low plasticity sticky clay ~ 10% fine	CL			0 1.0/2.0
				16	sand				0
			1,1,2,3		Same as above	CL			0 1.5/2.0
				18	Fine sand in tip ~ 2" thick	SM			0,0
			1,1,2,2		Light gray low plasticity sticky clay firm				0 1.5/2.0
565.51				20		CL			0,0
					EOB = 20'				
					Tremmie grout hole with bentonite slurry				
					2 bags powdered bentonite ~40 gallons grout				
560.51				25					
555.51				30					
550.51				35					
545.51				40					

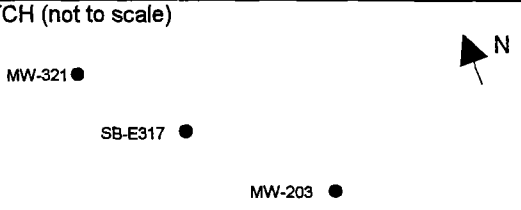
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E317	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 585.31	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/16/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 12'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~35, sunny, NE~5 mph			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
585.31									
585.31				6	Large cobbles brick and fill material	FILL			PID screening every 6" over spoon 0 = over cuttings
575.31			9,3,1,1	8 10	Black medium to coarse sand and cinder fill dry and loose	FILL			0 1.25/2.0 0,0
			7,4,4,3	12	Same as above, very moist	FILL			0 1.0/2.0 0 3" spoon
			4,4,10,4	14	Same as above wet	FILL			0,0 2.0/20 0,0 3" spoon
585.31			2,4,2,1	16	Same as above wet some asphalt-type material with sheen	FILL			0.5/2.0 0,0
	DC-SB-E317 (16-18')	11:15	1,2,2,1	18	Grey clay soft trace silt moist sticky	CL			0,0 2.0/20 0,0 3" spoon
565.31	DC-SB-DUP-1		0,1,0,1	20	Same as above with fine sand seams < 1" thick wet	CL			0,0 2.0/2.0 0,0
			0,0,1,1	22	Same as above Wet medium sand dark gray loose	CL SM			0,0 2.0/2.0 0,0
560.31				25	EOB = 22' Tremmie grout hole with bentonite slurry ~ 40 gallons of grout 2 bags bentonite powder, finish top 6" with gravel (eliminate trip hazard)				
555.31				30					
550.31				35					
545.31				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E318	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 580.92	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/16/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 7.5'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T ~40, Sunny, partly cloudy			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TIME	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
580.92									
					Gravel fill (crushed aggregate)				PID screening every 6" over spoons
575.92				5	Coarse sand and gravel fill				0 = over cuttings
			4,4,2,2		Coarse sand and angular fine gravel fill wet	FILL			0 1.0/2.0
570.92				10	Silt grey wet	ML			0 septic odor
			2,1,1,1		Wet grey clayey silt	ML			0 1.5/2.0 0,0 septic odor
	DC-SB-E318 (12-14')	12:30	1,2,2,1		Same as above with coarse sand lenses 6" thick	ML			0,0 1.5/2.0 0,0
565.92			1,1,1,1	15	Wet medium sand with clay seams 4" thick	SM			0,0 1.0/2.0 0,0
			2,1,1,3		Same as above with clay seams ~ 3" thick	SM			0,0 2.0/2.0 0,0
560.92			no spoon	20					Proceed with
			1,1,1,1		Wet grey fine to medium sand moderately sorted with trace of coarse sand, moderately angular	SM SM			0,0 2.0/2.0 0,0 spoons every 5'
555.92			11,10,8,10	25					Sand heave bail sand
					Very fine to medium gray sand wet poorly sorted angular trace silt	SM			0,0 2.0/2.0 0,0 heave before spoon
550.92				30					
			0,1,2,1		Very fine to fine gray sand poor sorting wet trace silt	SM			0,0 2.0/2.0 0,0
545.92				35					Change in drill pressure at ~ 33'.
			0,1,1,1		Silty clay (pasty) grey low-non plastic	CL			0,0 2.0/2.0 0,0 Set temp well
540.92				40	EOB = 37'				

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-C319	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.:	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/17/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T~35, NE ~10 mph, cloudy		SB-C-319 MW-114	
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
0									
					Black cindery fill	FILL			PID screening every 6" over spoons
-5				5					0 over cuttings
			1,2,3,5		Light grey silty fine sand with marl-like deposit	SM			0,0 2.0/20
-10				10	Black sand and silt very moist	SM			0,0
	DC-SB-C319 (10-12')		2,2,1,1		Black or dark grey clay low plasticity	CL			0,0 2.0/20
									0,0
			2,1,1,1		Blue grey low plasticity clay with little fine to medium sand	CL			0 1.5/2.0
									0,0
-15			1,1,1,1	15	Same as above	CL			0,0 2.0/2.0
					Medium to fine wet sand at 15.5'	SM			0,0
					EOB = 16'				
					Tremmie grout hole with bentonite slurry				
-20				20					
					1.5 bags bentonite slurry mix				
-25				25					
-30				30					
-35				35					
-40				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # C319-D	WELL #: MW-319	SITE NAME: Detroit Coke	PROJECT 2420-108

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
			pushed		Light brown/grey, well sorted fine to medium sand wet	SP			
533.79				45					VAS sample DC-319-D (42-47')
			1,2,0,1		Same as above 46-46.5' - grey fine to coarse sand	SP			
			Wt. of hammer		46.5-47' - grey clayey silt	ML			22" recovery
					Grey, soft, clay with 5% sand	CL			VAS temp well set at 47'.
528.79				50	EOB = 49'				
523.79				55					
518.79				60					
				65					
				70					
				75					
				80					
				85					
				90					

LEGEND: TOPSOIL SAND CLAY SILT GRAVEL

NOTES:

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-C319-D	WELL #: MW-319	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 578.79	TOC ELEV.: 581.87	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: Dennis	DRILLING RIG:	DRILL TYPE: 12.25"/4.25"
BORING START: 2/17/99	END: 2/25/99	LOCATION SKETCH (not to scale)	
WELL START: 2/25/99	END: 2/25/99		
WATER FIRST: ~20'	AT COMPLETION:		
SCREEN LOCATION: 20'	TO: 25'		
SCREEN TYPE: SS	SIZE: 0.010 slot		
CASING TYPE: GAL	DIAMETER: 2"		
WEATHER: T~35, NE ~10 mph, cloudy		SB-C-319 MW-114	
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
578.79									
					Same as C319				10" steel casing to 12.5' bgl. Grouted in place with bentonite cement. 12.25" HSA to 12', 4.25" to EOB.
573.79				5					
568.79				10					
					Clay				Attempted Shelby Tube - minimal recovery < 6"
563.79				15					
			0,1,2,3		Grey fine-medium sand with 10% gravel - wet slight sheen, no odor	SP			10" recovery PID = 0 ppm headspace
558.79				20					VAS sample DC-319-S
			0,2,2,3		Fine to medium sand grey subrounded	SP			
					21-21.5' Fine clayey sand - grey	SC			24" recovery
					21.5-22' Grey poorly sorted fine to coarse sand - wet	SW			PID = 0 ppm headspace sand heave
553.79			0,1,1,2	25	Poorly sorted fine to coarse sand grey, wet	SW			10" recovery
			0,1,1,2		Brown fine to medium well sorted sand	SP			18" recovery
548.79				30					
			0,1,2,1		Same as above	SP			18" recovery VAS sample DC-319-I
543.79				35					(30-35')
			0,0,0,2		Same as above, trace of coarse sand	SP			20" recovery
538.79				40					

LEGEND: TOPSOIL SAND CLAY SILT GRAVEL

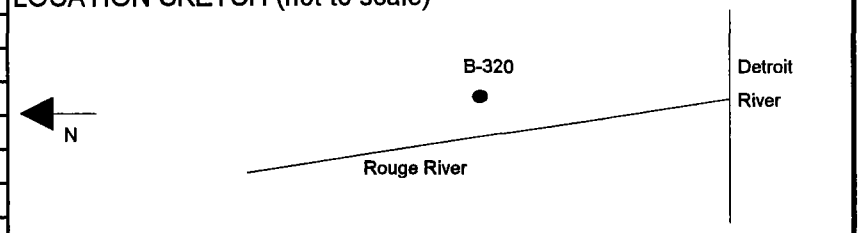
NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING # SB-B320	WELL #: MW-320	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.:	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/17/99	END: 2/17/99		
WELL START: 2/25/99	END:		
WATER FIRST: <8'	AT COMPLETION:		
SCREEN LOCATION: 12.3'	TO: 17.3'		
SCREEN TYPE: SS	SIZE: 0.010 slot		
CASING TYPE: GS	DIAMETER: 2"		
WEATHER: T ~40, cloudy			
Measurements in ft bgl.			

LOCATION SKETCH (not to scale)



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
0									
					Black tarry looking clayey slag and cinders				PID every 6" over spoons
-5				5					0 over cuttings
	DC-SB-B320		2,2,1,1		Wet medium sand sized cinders and slag with	FILL			0,0
-10				10	metallic luster				0,0 2.0/2.0
			1,2,1,1		Same as above, no luster	FILL			0,0
									0 1.5/2.0
			1,0,1,0		Cinders and slag, wet	FILL			0,0
					Same as above				0 1.5/2.0
-15			0,0,0,1	15	Cinders and slag, metallic luster, wet	FILL			0,0 VAS DC-320-I
									0,0 2.0/2.0 (12-17')
			0,0,1,1		Same as above	FILL			0,0 Heave into
									0,0 2.0/2.0 augers, bail
			1,1,2,1		Coarse sand fine gravel angular gray	FILL			0,0 proceed
-20				20					0,0 2.0/2.0 with basket
			1,1,2,3		Compacted medium to fine gravel with	FILL			0,0
				22	brick some clayey sand seams to 23'				0,0 2.0/2.0
			1,1,2,1		Same as above	FILL			0,0 VAS DC-320-D
				24	Gray sticky silty clay low plasticity	CL			0 1.5/2.0 (19-24')
0			0,0,1,0		Soapy white silty marl-like deposit with banding				0,0
				26	moist				0 2.0/2.0
				28		CL			
			0,0,0,0		No recovery sticky clay on exterior of spoon				No recovery
-30				30		CL			
			0,0,0,0		Gray sticky clay moist to very moist				2.0/2.0
						CL			
-35				35		CL			
			0,0,0,0		Gray sticky clay moist nonplastic				2.0/2.0
				37	EOB = 37'				Set temp well
					Set temp well				
0									

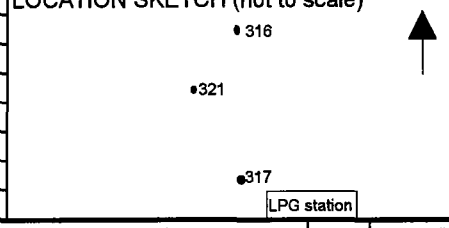
LEGEND: TOPSOIL SAND CLAY FILL GRAVEL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E321	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 584.88	TOC ELEV.:	LOGGED BY: Ken Ewers	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/19/99	END:	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: 11'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T~25, cloudy			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
584.88									
					Gravel fill	FILL			PID screening every 6" over spoons
579.88				5	Medium to coarse gravel dark gray	FILL			0 over cuttings
					Dark grey medium sand sized fill				
					Cindery fill	FILL			
574.88				10	Drilling rods to 11'				
			3,6,9,3		Wet coarse sand and fine gravel angular wet Fill some coarse gravel	FILL			0.5/2.0 Poor recovery 3" spoon
			3,3,4,2			FILL			0.5/2.0 3" spoon, poor recovery
569.88				15	Same as above				
			1,1,1,2		No recovery				0/2.0 No recovery
			0,0,0,0		Dark gray silty sandy clay very soft low-non plastic sticky	CL			1.0/2.0 No recovery, try 3" spoon
564.88				20	EOB = 19'				Set 10"casing to 18' bgl 16 bags Portland, 1 bag bentonite
559.88				25					
554.88				30					
549.88				35					
544.88				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E321D	WELL #: MW-321	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 584.88	TOC ELEV.: 587.05	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/19/99	END: 2/19/99	LOCATION SKETCH (not to scale)	
WELL START: 2/26/99	END: 2/26/99		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION: 19'	TO: 24'		
SCREEN TYPE: PVC	SIZE: 0.010 slot		
CASING TYPE: PVC	DIAMETER: 2"		
WEATHER: T 20's, cold, sunny			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
584.88									
					Same as SB-E321				
579.88				5					12.25" H.S.A. to 17.5'
									10" steel casing to 18'
574.88				10					
569.88				15					
		3 tries	No recovery		Clay - grey sandy	CL			On 2/22/99 - 1' of water
			1,2,2,1						in casing
		2 tries	No recovery	18					
			1,1,1,1		18-19' Grey sandy clay, 19-19.5' grey clayey sand,	CL			6" recovery
564.88				20	19.5-20' Fine to medium sand clay/silt	SC			3" spoon tried (1,1,2,2)
			1,1,1,3		Grey, wet, fine to medium sand clay, loose	CL			6" recovery
				22	Wet, grey medium sand	SM			no odor
			3,2,3,4		Grey, moderate plasticity, silty clay	CL			10" recovery, no odor
									VAS DC-321-D (19-24')
559.88			5,4,4,4	25	Grey, moderate plasticity, silty clay, med stiff	CL			12" recovery
			1,1,1,2		Soft, pastey, silty clay, sticky grey	CL			Set temp well (19-24')
				28					
			1,1,1,1		Same as above - with medium sand stringers	CL			
554.88				30					
			1-12"		Same as above - gravel	CL			
			1,1		sand stringer 1" at 31.5'				
			1-12"		Same as above - no stringers	CL			
			1-12"						
549.88			Weight of	35	Same as above - sticky clay	CL			
			rods						
			Weight of		Same as above	CL			
			rods	38					
544.88				40	EOB = 38'				

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E322	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 583.57	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/24/99	END: 2/24/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: ~12'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T~30, partly cloudy			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
583.57									
					Black cinder - fill dry	FILL			
578.57				5					
					White pasty, fine-grained material at 5' - damp	FILL			PID = 21 ppm headspace
			10,7,6,6		Black, dry, cinders, slag, gravel fill				
573.57				10					
			7,6,6,5		Wood, gravel, cinders on top, 12" of wood, wet at bottom	FILL			PID = 0 ppm headspace
			3,20, 17, 5		Black, wet, fill, angular gravel, sand/wood and cinders, fill to 15'	FILL			Wet at 12'
568.57			4,3,2,2	15					
					Grey silty clay - soft 2" no recovery - 3" spoon	CL			
			7,2,1,2		Grey sandy clay				
					EOB = 18'				
563.57				20					
					Borehole abandoned with bentonite slurry.				
558.57				25					
553.57				30					
548.57				35					
543.57				40					

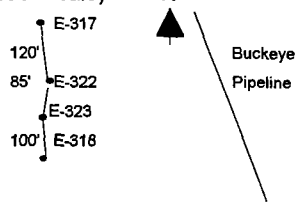
LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-E323	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 582.12	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S R: 11E 1/4:	1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/24/99	END: 2/26/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST:	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T~35, NE ~10 mph, cloudy			
Measurements in ft bgl.			



ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
582.12									
					Black - Fill - cinders gravel	FILL			
577.12				5					
			1,3,5,4		Fill, yellow - slag gravel cinders	FILL			8" recovery
									PID = 0 ppm
572.12				10					
			4,7,3,1		Fill black grey sand/gravel	FILL			12" recovery
					White grey pasty fine grained material - moist				PID = 0 ppm
			1,2,1,1		Wet white grey - fine grained material - similar to				VAS sample DC-E323
					lime - odor				PID = 0 ppm
567.12			4,2,1,1	15	Fill	FILL			
					Grey, soft, silty clay	CL			12" recovery, PID = 0 ppm
			2,2,2,2		Grey, wet, fine to medium sand well sorted	SP			16" recovery
			5,4,3,2		Same as above - 1" clay seam at 19.5'				14" recovery
562.12				20		SP			
			1,3,2,3		Grey fine to medium sand, wet	SP			18" recovery
557.12				25					sand heave
			3,2,2,3		Fine well sorted sand,	SP			12" recovery
552.12				30	clayey sand in shoe.				
			1,1,1,1		Fine sand w/ tr. clay	SC			
547.12				35					
			1 - weight of rods		Sticky soft clay grey	CL			
					EOB = 37'				
					Abandoned borehole with bentonite after temp				
542.12				40	well pulled on 2/26/99				

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

MALCOLM PIRNIE

WELL / BORING LOG

BORING #: SB-324	WELL #:	SITE NAME: Detroit Coke	PROJECT 2420-108
GROUND ELEV.: 580.90	TOC ELEV.:	LOGGED BY: Dan Bremer	
COUNTY: Wayne	TWP: Detroit	SECTION: 27 T: 2S	R: 11E 1/4: 1/4:
DRILL CO.: Stearns	DRILLER: John Verrett	DRILLING RIG: CME 1050	DRILL TYPE: 4.25" HSA
BORING START: 2/25/99	END: 2/25/99	LOCATION SKETCH (not to scale)	
WELL START:	END:		
WATER FIRST: ~8'	AT COMPLETION:		
SCREEN LOCATION:	TO:		
SCREEN TYPE:	SIZE:		
CASING TYPE:	DIAMETER:		
WEATHER: T~35, NE ~10 mph, cloudy			
Measurements in ft bgl.			

ELEV. FT.	SAMPLE NUMBER	SAMP TYPE	BLOW COUNT	DEPTH (bgl)	STRATIGRAPHIC DESCRIPTION	USCS	STRAT. SYMBOL	VAS	REMARKS ODOR, FLUID LOSS, ...
580.90									
575.9				5					
			5,5,9,4		Black, gravel, slag fill, grey/white moist clayey white material	FILL			14" recovery PID = 0 ppm
570.9				10					
			Wt. of hammer		Moist, silty clay, brown soft native(?)	CL			16" recovery PID = 0 ppm
565.9				15					
			14,50-3"		Black, medium sand gravel - moist - Fill?	SW			6" recovery PID = 0 ppm
560.9				20					
			3,3,2,1		Grey, medium stiff, silty clay - 5% medium sand - moist	CL			18" recovery PID = 0 ppm
555.9				25	Sand zone - med - wet				
					Grey sticky clay moist to very moist	CL			sand heave
550.9				30	EOB 27' Abandoned borehole with bentonite slurry.				
545.9				35					
540.9				40					

LEGEND: TOPSOIL SAND CLAY SILT FILL

NOTES: bgl - below ground level

WELL CONSTRUCTION LOG

BORING #: SB-201	WELL #: MW-201	SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL 1	INTERVAL 2	INTERVAL 3
TOP OF PROTECTIVE PIPE			
STICKUP	3'		
FLUSH MOUNT			
CONCRETE	0-2.5'		
GROUT			
BENTONITE SEAL	7.8-2.5'		
CUTTINGS/NATURAL COLLAPSE			
ARTIFICIAL SANDPACK	7.8-15.3'		
PERMANENT SCREEN INTERVAL	10.3-15.3'		
WELL BOTTOM	15.3'		
BOTTOM OF BORING (EOB)	15.3'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL		SS	X	OTHER	PVC			
NOM. DIA.	X	2"		OTHER				
PERF. TYPE	X	SLOTTED				OTHER		
SLOT SIZE		7	X	10		OTHER		
LENGTH	5'							

CASING

MATERIAL		GS	X	PVC		OTHER		
NOM. DIA.	X	2"		4"		6"	OTHER	
SCHEDULE	X	40		OTHER				
JOINT TYPE		COUPLINGS	X	THREADED				
SECT. LENGTH	10'							

PROTECTION

PROTECTOR INSTALLED?	X	YES		NO
NOM. DIA./TYPE	4"			
LENGTH OVERALL	5'			
LENGTH IN GROUND	2'			
LOCKING CAP?	X	YES		NO
KEY NO.	X	3374		OTHER
PROTECTIVE POSTS?		YES	X	NO

CASING RECORD (including double casing)

SIZE (DIA.)	2"	FROM	2.8' agl	TO	10.3'
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

DRILLING RECORD

METHOD	X	4 1/4" ID HSA		
FLUID		YES	X	NO

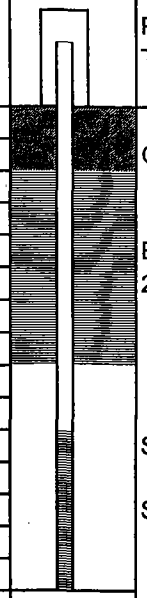
TEMPORARY SCREEN INTERVALS

1.) FROM		TO	o
2.) FROM		TO	
3.) FROM		TO	
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	

DEPTH

VAS

WELL PROFILE



MATERIALS/ REMARKS

Pro-casing ~3'
TOC 2.8'
GROUND SURFACE
Concrete 0-2.5'
Bentonite Hole Plug 2.5-7.8'
Sand 7.8-15.3'
Screen 10.3-15.3'
Developed with Moyno pump, ~50 gallons, water clear at end of pumping.

LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

WELL CONSTRUCTION LOG

BORING #: SB-202 | WELL #: MW-202S | SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL	INTERVAL	INTERVAL
TOP OF PROTECTIVE PIPE			
STICKUP	3'		
FLUSH MOUNT			
CONCRETE	1'		
GROUT			
BENTONITE SEAL	1-2.8'		
CUTTINGS/NATURAL COLLAPSE			
ARTIFICIAL SANDPACK	2.8-9.4'		
PERMANENT SCREEN INTERVAL	4.4-9.4'		
WELL BOTTOM	9.4'		
BOTTOM OF BORING (EOB)	10'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL		SS	X	OTHER	PVC			
NOM. DIA.	X	2"		OTHER				
PERF. TYPE	X	SLOTTED				OTHER		
SLOT SIZE		7	X	10		OTHER		
LENGTH	5'							

CASING

MATERIAL		GS	X	PVC		OTHER		
NOM. DIA.	X	2"		4"		6"	OTHER	
SCHEDULE	X	40		OTHER				
JOINT TYPE		COUPLINGS	X	THREADED				
SECT. LENGTH	5'							

PROTECTION

PROTECTOR INSTALLED?	X	YES		NO
NOM. DIA./TYPE	4"			
LENGTH OVERALL	5'			
LENGTH IN GROUND	2'			
LOCKING CAP?	X	YES		NO
KEY NO.	X	3374		OTHER
PROTECTIVE POSTS?		YES	X	NO

CASING RECORD (including double casing)

SIZE (DIA.)	2"	FROM	2.5' agl	TO	4.4'
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

DRILLING RECORD

METHOD	X	4 1/4" ID HSA		
FLUID		YES	X	NO

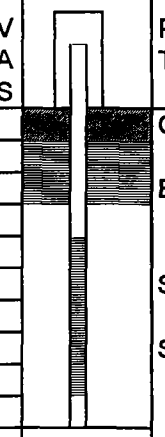
TEMPORARY SCREEN INTERVALS

1.) FROM		TO	
2.) FROM		TO	
3.) FROM		TO	
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	

DEPTH: 5, 10, 15, 20, 25, 30, 35, 40, 45

VAS

WELL PROFILE



MATERIALS/ REMARKS

Pro-casing ~3' agl
TOC ~2.5'
GROUND SURFACE
Concrete 0-1'
Bentonite 1-2.8'
Sandpack 2.8-10'
Screen 4.4-9.4'

6 bags of sand
1 bag of hole plug
2 bags of cement

Developed with Moyno pump pumped ~50 gallons, clear at end of pumping.

LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

WELL CONSTRUCTION LOG

BORING #: SB-202D	WELL #: MW-202D	SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL 1	INTERVAL 2	INTERVAL 3
TOP OF PROTECTIVE PIPE	~2.8' agl		
STICKUP	~ 2.4 agl		
FLUSH MOUNT			
CONCRETE	0-2'		
GROUT			
BENTONITE SEAL	2-12.2'		
CUTTINGS/NATURAL COLLAPSE			
ARTIFICIAL SANDPACK	12.2-20.6'		
PERMANENT SCREEN INTERVAL	15.6-20.6'		
WELL BOTTOM	20'		
BOTTOM OF BORING (EOB)	27'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL	X	SS		OTHER	PVC			
NOM. DIA.	X	2"		OTHER				
PERF. TYPE	X	SLOTTED					OTHER	
SLOT SIZE		7	X	10			OTHER	
LENGTH	5'							

CASING

MATERIAL	X	GS		PVC		OTHER		
NOM. DIA.	X	2"		4"		6"	OTHER	
SCHEDULE	X	40		OTHER				
JOINT TYPE	X	COUPLINGS		THREADED				
SECT. LENGTH								

PROTECTION

PROTECTOR INSTALLED?	X	YES		NO
NOM. DIA./TYPE	4"			
LENGTH OVERALL	5'			
LENGTH IN GROUND	2'			
LOCKING CAP?	X	YES		NO
KEY NO.	X	3374		OTHER
PROTECTIVE POSTS?		YES	X	NO

CASING RECORD (including double casing)

SIZE (DIA.)	2"	FROM	2.5 agl	TO	15.6'
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

DRILLING RECORD

METHOD	X	4 1/4" ID HSA		
FLUID		YES	X	NO

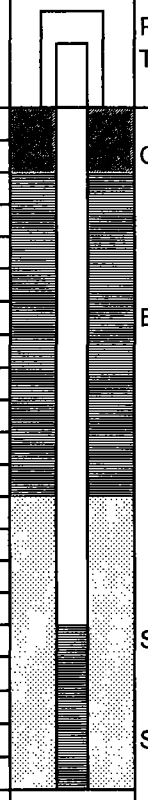
TEMPORARY SCREEN INTERVALS

1.) FROM	15'	TO	20'
2.) FROM		TO	
3.) FROM		TO	
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	

DEPTH

VAS

WELL PROFILE



MATERIALS/ REMARKS

Pro-casing ~2.8'
TOC 2.4'
GROUND SURFACE
Concrete 0-2'
Bentonite Seal 2-12.2'
Sandpack 12.2-20.6'
Screen 15.6-20.6'
Natural collapse 20.6'-27'
4 bags of #7 sand
4 bags of hole plug

LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

WELL CONSTRUCTION LOG

BORING #: SB-203	WELL #: MW-203	SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL 1	INTERVAL 2	INTERVAL 3
TOP OF PROTECTIVE PIPE	3'		
STICKUP	3'		
FLUSH MOUNT			
CONCRETE	0-2'		
GROUT	2-5'		
BENTONITE SEAL	5-7'		
CUTTINGS/NATURAL COLLAPSE	14-15'		
ARTIFICIAL SANDPACK	7-14'		
PERMANENT SCREEN INTERVAL	9-14'		
WELL BOTTOM	14'		
BOTTOM OF BORING (EOB)	15'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL		SS	X	OTHER	PVC			
NOM. DIA.	X	2"		OTHER				
PERF. TYPE	X	SLOTTED				OTHER		
SLOT SIZE		7	X	10		OTHER		
LENGTH	5'							

CASING

MATERIAL		GS	X	PVC		OTHER		
NOM. DIA.	X	2"		4"		6"	OTHER	
SCHEDULE	X	40		OTHER				
JOINT TYPE		COUPLINGS	X	THREADED				
SECT. LENGTH	10'							

PROTECTION

PROTECTOR INSTALLED?	X	YES		NO
NOM. DIA./TYPE	4"			
LENGTH OVERALL	5'			
LENGTH IN GROUND	2'			
LOCKING CAP?	X	YES		NO
KEY NO.	X	3374		OTHER
PROTECTIVE POSTS?		YES	X	NO

CASING RECORD (including double casing)

SIZE (DIA.)	2"	FROM	2.5' agl	TO	9 bgl
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

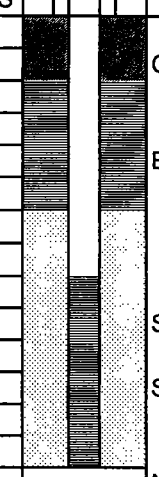
DRILLING RECORD

METHOD	X	4 1/4" ID HSA		
FLUID		YES	X	NO

TEMPORARY SCREEN INTERVALS

1.) FROM	9'	TO	14'
2.) FROM		TO	
3.) FROM		TO	
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	

DEPTH (VAS)



WELL PROFILE

MATERIALS/REMARKS

GROUND SURFACE

Concrete 0-2'

Bentonite Seal 5-7'

Sandpack 7-14'

Screen 9-14'

Natural collapse 14-15'

4 bags of #7 sand
3 bags of hole plug

Developed well with rig.

LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

WELL CONSTRUCTION LOG

BORING #: SB-306D | WELL #: MW-306D | SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL 1	INTERVAL 2	INTERVAL 3
TOP OF PROTECTIVE PIPE			
STICKUP	3' agl		
FLUSH MOUNT	0-1'		
CONCRETE			
GROUT	2-13.5'		
BENTONITE SEAL	13.5-15.3'		
CUTTINGS/NATURAL COLLAPSE			
ARTIFICIAL SANDPACK	15.3-23.5'		
PERMANENT SCREEN INTERVAL	18.5-23.5'		
WELL BOTTOM	23'		
BOTTOM OF BORING (EOB)	24'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL	[X]	SS	[ ]	OTHER	PVC			
NOM. DIA.	[X]	2"	[ ]	OTHER				
PERF. TYPE	[X]	SLOTTED			[ ]	OTHER		
SLOT SIZE	[ ]	7	[X]	10	[ ]	OTHER		
LENGTH	5'							

CASING

MATERIAL	[X]	GS	[ ]	PVC	[ ]	OTHER		
NOM. DIA.	[X]	2"	[ ]	4"	[ ]	6"	OTHER	
SCHEDULE	[X]	40		OTHER				
JOINT TYPE	[X]	COUPLINGS	[ ]	THREADED				
SECT. LENGTH	10'							

PROTECTION

PROTECTOR INSTALLED?	[X]	YES	[ ]	NO
NOM. DIA./TYPE	4"			
LENGTH OVERALL	5'			
LENGTH IN GROUND	2'			
LOCKING CAP?	[X]	YES	[ ]	NO
KEY NO.	[X]	3374	[ ]	OTHER
PROTECTIVE POSTS?	[ ]	YES	[X]	NO

CASING RECORD (including double casing)

SIZE (DIA.)	10"	FROM	0'	TO	12'
SIZE (DIA.)	2"	FROM	2.5' agl	TO	18 bgl
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

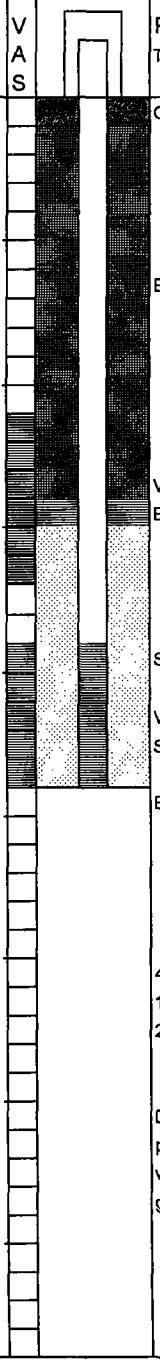
DRILLING RECORD

METHOD	[X]	4 1/4" ID HSA		
FLUID	[ ]	YES	[X]	NO

TEMPORARY SCREEN INTERVALS

1.) FROM	15'	TO	20'
2.) FROM		TO	
3.) FROM		TO	
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	

DEPTH | VAS | WELL PROFILE | MATERIALS/REMARKS



Pro-casing ~2.8'
TOC 2.4'

Concrete 0-1'

Bentonite Grout 1-13.5'

VAS 12-17' DC-306-I
Bentonite Seal 13.5-15.3'

Sandpack 15.3-23.5'

VAS 19-24' DC-306-D
Screen 18.5-23.5

EOB 24'

4 bags of #7 sand
1 bag of Bentonite pellets
2 bags of Bentonite powder

Developed well with Moyno pump. Not producing much water, removed ~ 20 gallons, grey - some silt

LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

WELL CONSTRUCTION LOG

BORING #: SB-319D	WELL #: MW-319D	SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL 1	INTERVAL 2	INTERVAL 3
TOP OF PROTECTIVE PIPE			
STICKUP	~2.5'		
FLUSH MOUNT			
CONCRETE	0-2'		
GROUT			
BENTONITE SEAL	2'-17.5'		
CUTTINGS/NATURAL COLLAPSE	25'-47'		
ARTIFICIAL SANDPACK	17.5'-25'		
PERMANENT SCREEN INTERVAL	20'-25'		
WELL BOTTOM	25'		
BOTTOM OF BORING (EOB)	47'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL	X	SS		OTHER	PVC			
NOM. DIA.	X	2"		OTHER				
PERF. TYPE	X	SLOTTED				OTHER		
SLOT SIZE		7	X	10		OTHER		
LENGTH		5'						

CASING

MATERIAL	X	GS		PVC		OTHER		
NOM. DIA.	X	2"		4"		6"	OTHER	
SCHEDULE	X	40		OTHER				
JOINT TYPE	X	COUPLINGS		THREADED				
SECT. LENGTH		22.5'						

PROTECTION

PROTECTOR INSTALLED?	X	YES		NO
NOM. DIA./TYPE		4"		
LENGTH OVERALL		5'		
LENGTH IN GROUND		2'		
LOCKING CAP?	X	YES		NO
KEY NO.	X	3374		OTHER
PROTECTIVE POSTS?		YES	X	NO

CASING RECORD (including double casing)

SIZE (DIA.)	2"	FROM	2.5' agl	TO	20'
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

DRILLING RECORD

METHOD	X	4 1/4" ID HSA		
FLUID		YES	X	NO

TEMPORARY SCREEN INTERVALS

1.) FROM	42'	TO	47'
2.) FROM	30'	TO	35'
3.) FROM	16'	TO	21'
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	

DEPTH	VAS	WELL PROFILE	MATERIALS/ REMARKS
			Pro-casing ~3' agl
			GROUND SURFACE
			Concrete 0-2'
			10" casing to 12.5'
10			Bentonite Slurry 2-16'
			VAS 16-21' DC-319-S
20			Sandpack 17.5-25'
			Screen 20-25'
30			VAS 30-35' DC-319-I
40			Natural Collapse 25-47'
			VAS 42-47' DC-319-D
50			2 bags of Bentonite Slurry
			3 bags of sand
60			Well was developed with Moyno Pump, ~55 gallons purged, water was clear
70			
80			
90			

LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

WELL CONSTRUCTION LOG

BORING #: SB-B320	WELL #: MW-320	SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL 1	INTERVAL 2	INTERVAL 3
TOP OF PROTECTIVE PIPE	3'		
STICKUP	2.5'		
FLUSH MOUNT			
CONCRETE	0-2'		
GROUT			
BENTONITE SEAL	2-9.5'		
CUTTINGS/NATURAL COLLAPSE			
ARTIFICIAL SANDPACK	9.5-17.3'		
PERMANENT SCREEN INTERVAL	12.3-17.3'		
WELL BOTTOM	17.3'		
BOTTOM OF BORING (EOB)	24'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL	X	SS		OTHER	PVC			
NOM. DIA.	X	2"		OTHER				
PERF. TYPE	X	SLOTTED					OTHER	
SLOT SIZE		7	X	10			OTHER	
LENGTH	5'							

CASING

MATERIAL	X	GS		PVC		OTHER		
NOM. DIA.	X	2"		4"		6"	OTHER	
SCHEDULE	X	40		OTHER				
JOINT TYPE	X	COUPLINGS		THREADED				
SECT. LENGTH	14.8'							

PROTECTION

PROTECTOR INSTALLED?	X	YES		NO
NOM. DIA./TYPE	4"			
LENGTH OVERALL	5'			
LENGTH IN GROUND	2'			
LOCKING CAP?	X	YES		NO
KEY NO.	X	3374		OTHER
PROTECTIVE POSTS?		YES	X	NO

CASING RECORD (including double casing)

SIZE (DIA.)		FROM	2.5' agl	TO	12.3'
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

DRILLING RECORD

METHOD	X	4 1/4" ID HSA		
FLUID		YES	X	NO

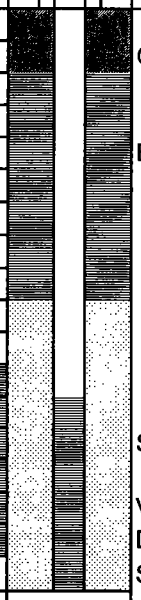
TEMPORARY SCREEN INTERVALS

1.) FROM		TO	
2.) FROM		TO	
3.) FROM		TO	
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	

DEPTH

VAS

WELL PROFILE



MATERIALS/ REMARKS

Pro-casing ~3'
TOC 2.5'
GROUND SURFACE
Concrete 0-2'
Bentonite Pellets 2-9.5'
Sandpack 9.5-17.3'
VAS 12-17'
DC-320-I
Screen 12.3-17.3'
VAS 19-24'
DC-320-D
Developed well with Moyno Pump, water was grey initially, silty, then cleared up.
4 bags of #7 sand
4 bags of Bentonite pellets
Developed well with rig.

LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

WELL CONSTRUCTION LOG

BORING #: SB-321 | WELL #: MW-321 | SITE NAME: Detroit Coke

CONSTRUCTION DETAILS

	INTERVAL 1	INTERVAL 2	INTERVAL 3
TOP OF PROTECTIVE PIPE	~3'		
STICKUP	~2.5'		
FLUSH MOUNT			
CONCRETE	0-2'		
GROUT	2-15'		
BENTONITE SEAL	15-17'		
CUTTINGS/NATURAL COLLAPSE	24-38'		
ARTIFICIAL SANDPACK	17-24'		
PERMANENT SCREEN INTERVAL	19-24'		
WELL BOTTOM	24'		
BOTTOM OF BORING (EOB)	38'		

SCREEN CONSTRUCTION MATERIALS

MATERIAL		SS	X	OTHER	PVC			
NOM. DIA.	X	2"		OTHER				
PERF. TYPE	X	SLOTTED				OTHER		
SLOT SIZE		7	X	10		OTHER		
LENGTH	5'							

CASING

MATERIAL		GS	X	PVC		OTHER		
NOM. DIA.	X	2"		4"		6"	OTHER	
SCHEDULE	X	40		OTHER				
JOINT TYPE		COUPLINGS	X	THREADED				
SECT. LENGTH	20.5'							

PROTECTION

PROTECTOR INSTALLED?	X	YES		NO
NOM. DIA./TYPE	4"			
LENGTH OVERALL	5'			
LENGTH IN GROUND	2'			
LOCKING CAP?	X	YES		NO
KEY NO.	X	3374		OTHER
PROTECTIVE POSTS?		YES	X	NO

CASING RECORD (including double casing)

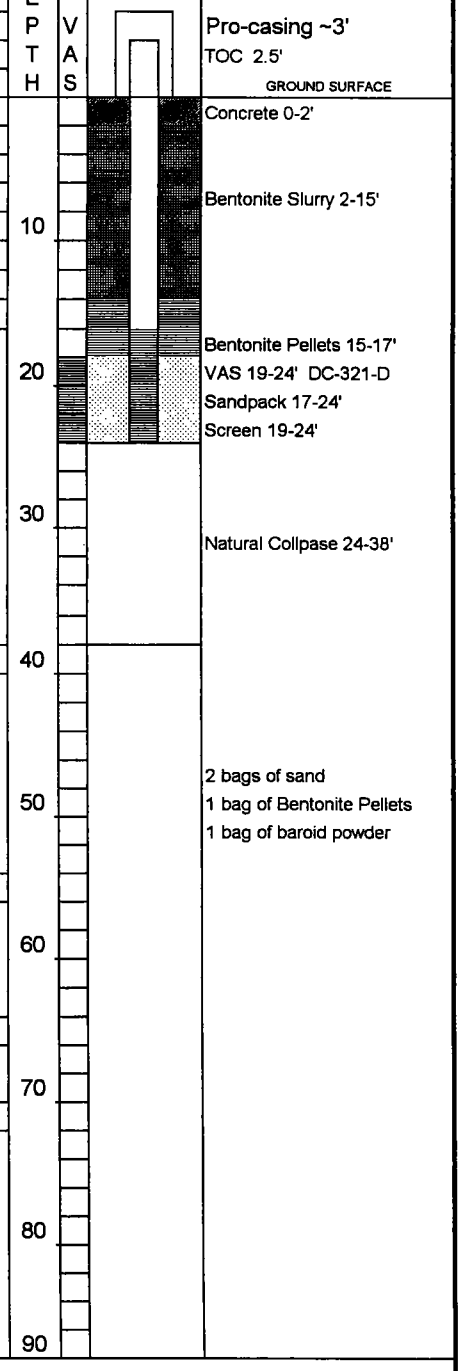
SIZE (DIA.)	2"	FROM	2.5 agl	TO	19' bgl
SIZE (DIA.)	10"	FROM	0	TO	18' bgl
SIZE (DIA.)		FROM		TO	
SIZE (DIA.)		FROM		TO	

DRILLING RECORD

METHOD	X	4 1/4" ID HSA			
FLUID		YES	X	NO	

TEMPORARY SCREEN INTERVALS

1.) FROM	19'	TO	24'
2.) FROM		TO	
3.) FROM		TO	
4.) FROM		TO	
5.) FROM		TO	
6.) FROM		TO	
7.) FROM		TO	



LEGEND:

Concrete | Grout | Bentonite Seal | Artificial Sandpack | Cuttings/ Natural Collapse

NOTES: agl - ABOVE GROUND LEVEL bgl - BELOW GROUND LEVEL

APPENDIX B

TEST PIT LOGS

TEST PIT LOGS
FORMER DETROIT COKE SITE
WAYNE COUNTY, MICHIGAN

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/18/99	#1	0-1.5'	0	Topsoil and brown sand
		1.5'-5.5'	6	White slag, red slag and brown sand
		5.5'-6.5'	16	Slag and gravel, black tar-like material seeping into test pit at ~ 5.5 bgl
		6.5'-8.5'	0	Brown silty sand with/trace clay, wet

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/17/99	#2	0-2'	0	Black cinders, coal, black silty sand
		2'-3'	0	Green and white slag
		3'-6'	0	Red silty sand with trace clay
		6'-9'	0	Brown/rust colored silty sand with trace clay; wet at 7.5' bgl
		9'-10'	0	Brown silty sand with white oolitic material

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/17/99	#3	0-1'	0	Black silty sand
		1-9'	1.5	Black silty sand with red brick, concrete and metal debris; petroleum type odor; wet at 5' bgl

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/17/99	#4	0-3.5'	0	Black silty sand with bricks, wood, gravel, and demolition debris
		3.5'-5'	0	Black silty sand with trace gray clay; wet at 5' bgl
		5'-7'	0	Tan and black silty clay with trace sand
		7'-8.5'	0	Tan silty clay with trace gravel

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/18/99	#5	0-1'	0	Asphalt and black fine grained sand
		1-2.5'	10.9	White slag material
		2.5'-4'	14.7	Silty sand and slag fragments
		4'-6'	16	Red slag and sand, wet, red colored liquid, black tar-like material seeping into excavation, strong burnt oil odor
		6'-8'	17	Slag, black tar-like material seeping into excavation
		8'-9'	37	Gray/black coal tar (plastic, clay-like material)

TEST PIT LOGS
FORMER DETROIT COKE SITE
WAYNE COUNTY, MICHIGAN

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/18/99	#6	0-1'	0	Asphalt underlain by compacted slag
		1'-2'	0	Railroad ties and slag
		2'-6'	0	Slag and gravel
		6'-7.5'	0	Brown silty sand with trace clay, wet at 7' bgl
		7.5'-10'	0	Pink and white fine grained material

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/17/99	#7	0-4'	3.9	Black silty sand with gravel, slag, and demolition debris
		4'-5'	6.5	Black silty sand and cinders with silver-gray sheen coating; strong petroleum odor; wet at 5' bgl
		5'-8'	---	Black silty sand and white oolitic material with silver-gray sheen coating

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/17/99	#8	0-1'	3.5	Black cinders and slag
		1'-2.5'	6	Cinders, slag, and brick debris
		2.5'-3.5'	10.6	Black cinders, slag, and brick debris; wet at 3.5' bgl
		3.5'-7'	0	Silty sand with clay, some slag, wet

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/17/99	#9	0-2'	3.5	Black cinders and slag
		2'-4'	0	Concrete slab and concrete rubble
		4'-5'	139	Black cinders
		5'-7'	224	Black cinders, slag and concrete rubble; green liquid seeping into test pit sidewall at 6' bgl
		7'-10'	0	Black cinders, slag and gravel; wet at 9' bgl

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/18/99	#10	0-4"		Asphalt
		4"-10"		Concrete
		10"-3'	0	Black silty sand with slag
		3'-3.5'	0	Tan sand stringer
		3.5'-5.5'	0	Slag and crushed refractory brick
		5.5'-7'	0	Fine grained sand and refractory brick, wet
		7'-9'	0	Brown to gray silty clay

TEST PIT LOGS
FORMER DETROIT COKE SITE
WAYNE COUNTY, MICHIGAN

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/16/99	#11	0-1'	6.2	Black cinder fill material
		1'-6'	6.4	Demolition debris and slag
		6'-7'	3.8	White oolitic material; moist
		7'-10'	7.9	Black cinders and slag
		10'-11'	16.4	Black clay with peat and sand stringers

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/16/99	#12	0-1'	0	Black cinder fill material
		1'-2.5'	0.5	Black cinder fill with demolition debris (refractory brick, railroad ties and rail)
		2.5'-3.5'	---	White oolitic material
		3.5'-11'	1.9	Black cinders and slag
		11'-13'	2.8	Black clay

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/16/99	#13	0-2'	---	Black, gravely, cinder fill
		2'-12'	200	Brown to black, gravely fill with slag, brick, and concrete fragments; wet at 10' bgl

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/16/99	#14	0-4'	1.3	Black cinder fill and slag
		4'-7'	12.4	Brown silty sand
		7'-10'	2.9	White oolitic material; moist
		10'-13'	0	Brown silty sand with trace clay

DATE	TEST PIT	DEPTH (BGL)	PID (PPM)	DESCRIPTION
02/16/99	#15	0-1'	0	Black cinder fill material
		1'-4'	0	Black and white nodules, wood, and brick
		4'-8'	0	Black cinders
		8'-9.5'	0	Gray sand and gravel; wet at 9' bgl
		9.5'-14'	0	Gray silty sand with some clay and gravel

Notes:

--- no PID reading recorded

APPENDIX C

TEST PIT PUMPING LOGS

TEST PIT OBSERVATIONS
FEBRUARY25, 1999
FORMER DETROIT COKE SITE
WAYNE COUNTY, MICHIGAN

DATE	TEST PIT	DEPTH TO WATER (BGL)	GALLONS EVACUATED	DESCRIPTION OF FLUIDS
02/25/99	#1	~4.5'	~600	Water with black floating tar, some sinkers on bottom
02/25/99	#2	~4'	~700	Water, no sheen
02/25/99	#3	~3'	~400	Clear, clean water
02/25/99	#4	---	None	Inaccessable; no floating product
02/25/99	#5	~3'	~400	Red water, collected samples for lab analysis
02/25/99	#6	~3'	~1000	Brown to black water; no floating or sinking free product
02/25/99	#7	~6"-1'	~600	Slight sheen on water
02/25/99	#8	~1'	~300	Sheen on water, product on bottom of pit
02/25/99	#9	~11'	~100	Only 1' water, green; no visible product, immediate recovery
02/25/99	#10	~3'	None	Did not pump; no floating product
02/25/99	#11	~4'	~800	Some scum on brown water; no free product
02/25/99	#12	~9'	~200	Only 2' of brown to black colored water; no recharge
02/25/99	#13	~9.5'	<50	Water with slight brown color, no visible recharge
02/25/99	#14	~8.5'	~1500	Brown water; some brown scum, no product (floater or sinker)
02/25/99	#15	~5'	~1500	Clear to brown water; no scum or product

TEST PIT OBSERVATIONS
MARCH 5, 1999
FORMER DETROIT COKE SITE
WAYNE COUNTY, MICHIGAN

DATE	TEST PIT	DEPTH TO WATER (BGL)	GALLONS EVACUATED	DESCRIPTION OF FLUIDS
03/05/99	#1	~6.5'	~200	Floating black tar-like substance in pit at start, after pumping nothing observed entering pit but DNAPL on base of pit draw down about 2'
03/05/99	#2	~4'	~700	Black water, after pumping water entering pit has a sheen, no free product observed, draw down about2.5'
03/05/99	#3	~3.5'	~650	Black water, no observed free product, rapid recharge, draw down about 2'
03/05/99	#4	~4.5'	~200	Black water with heavy sheen entering pit, no observable product observed, draw down about 1'
03/05/99	#5	~3'	~750	Strong tar odor, black water with very heavy sheen entering pit, draw down about 3'
03/05/99	#6		None	Pits flooded by broken water main
03/05/99	#7		None	Pits flooded by broken water main
03/05/99	#8	~3.5'	~200	Black water entering pit, no free product observed, draw down about 1'
03/05/99	#9	~9.5'	~50	Yellowish-green water, draw down ~.25'
03/05/99	#10		None	
03/05/99	#11	~4'	~1500	Black water, no observable product, draw down about 1'
03/05/99	#12	~11'	~200	Black water, draw down about 1', no observable product
03/05/99	#13	~11.5'	None	Not pumped
03/05/99	#14	~9'	~1400	Black water, draw down about 4', no product, recharging quickly
03/05/99	#15	~6'	~1400	No observable tar or free product, draw down about 6'

TEST PIT OBSERVATIONS
MARCH 10, 1999
FORMER DETROIT COKE SITE
WAYNE COUNTY, MICHIGAN

DATE	TEST PIT	DEPTH TO WATER	GALLONS EVACUATED	DESCRIPTION OF FLUIDS
3/10/99	#1	~4.5'	~400	Black tar-like substance on ice in pit, pump screen, and sides of pit, removed all water from pit, recharging slowly, DNAPL?
3/10/99	#2	~4.5'	~400	Water appears black with a sheen, draw down about 1.5', recharging slowly
3/10/99	#3	~3'	~400	Water under ice in pit looks black, draw down about 1' incoming water looks black with a sheen, recharging at a moderate rate
3/10/99	#4		0	Cannot access
3/10/99	#5	~2.5'	~600	Water standing in pit is black, after water is drawn down about 2' a strong odor is noticed, all water is removed from pit, black water with heavy sheen is observed seeping into the pit especially from the N and S sides at a fairly slow rate
3/10/99	#6		None	Due to broken water line pit is filled with ice
3/10/99	#7		None	Due to broken water line pit is filled with ice
3/10/99	#8	~3'	~75	Brown water with a sheen, draw down ~8" (to bottom), very slow recovery
3/10/99	#9	~10.5'	~75	Water in pit is orage/rust colored in places, recharge water is very green, recharging quickly from SE corner of pit, 6-8" draw down (to bottom)
3/10/99	#10	~3.5'	~200	Brown water with slight sheen, no observable product, drew down water to bottom of pit, moderate recharge
3/10/99	#11	~4'	~1000	Black water, draw down about 18", recharging very quickly particularly from the NW side of the pit
3/10/99	#12	~12'	None	No fluids removed
3/10/99	#13	~10.5	~250	Black to brown water with sheen, rapid recharge from E side of pit (W side of pit bottom is frozen solid),
3/10/99	#14	~10'	~1000	Black water with a little sheen, draw down about 5', recovery water gray/black, quick recovery from all sides of pit
3/10/99	#15	~5.5'	~1200	Gray water with a slight sheen, no visible product, draw down about 6', moderate recharge rate

Note:

Due to weather conditions involving blowing snow most of the test pits were filled to varying degrees with snow/slush/ice making test pit fluid observations difficult.

APPENDIX D

PHOTO LOG

FORMER DETROIT COKE SITE
2420-108
February 16, 1999

Excavation and stockpiling of material from Test Pit 13.

FORMER DETROIT COKE SITE
2420-108
February 16, 1999

Test Pit 15 sidewall. Note various layers of fill material including cinders, slag, and white "oolitic" fill material.

FORMER DETROIT COKE SITE
2420-108
February 16, 1999

Completed Test Pit 14 with lockable enclosure.

FORMER DETROIT COKE SITE
2420-108
February 17, 1999

Silver colored petroleum saturated fill material excavated from Test Pit 7.

FORMER DETROIT COKE SITE
2420-108
February 17, 1999

Test Pit 7 water with oil sheen.

FORMER DETROIT COKE SITE
2420-108
February 18, 1999

Test Pit 5 sidewall with black tar like material seeping into pit sidewall through slag layer beneath white "oolitic" layer.

FORMER DETROIT COKE SITE
2420-108
February 18, 1999

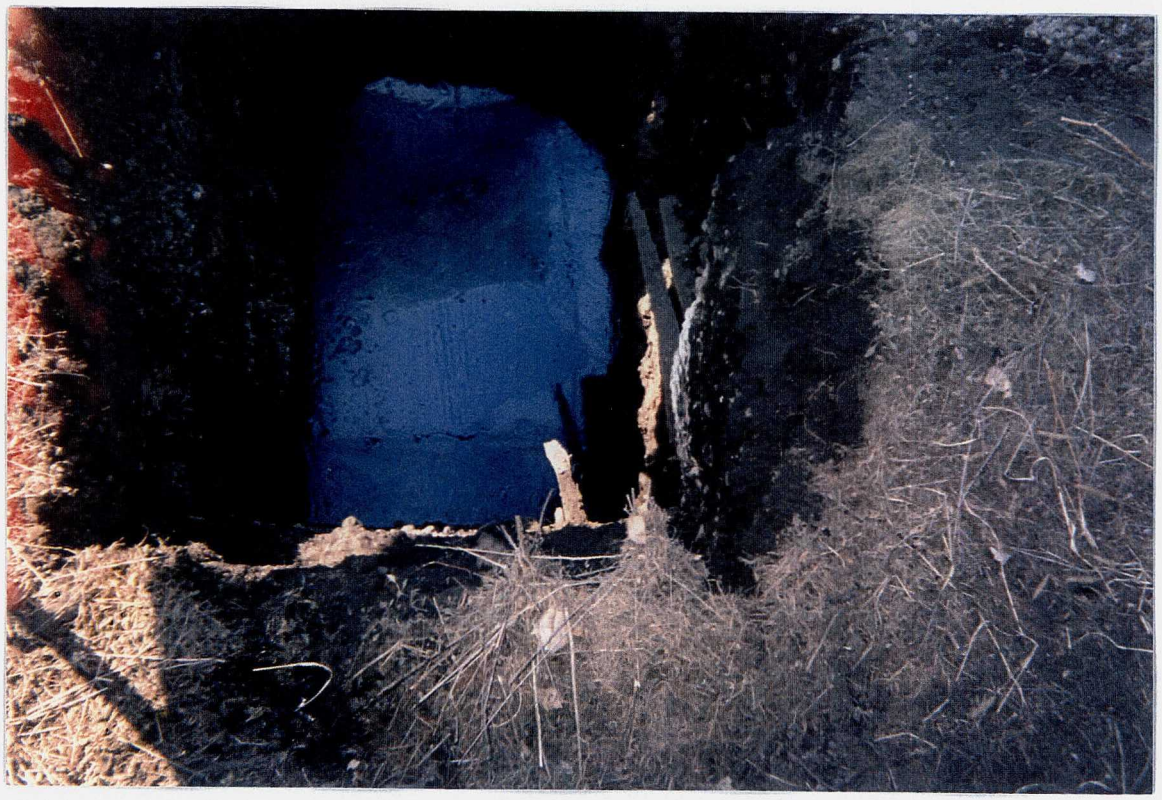
Test Pit 1 sidewall with reddish black liquid seeping in near bottom of trench.

FORMER DETROIT COKE SITE
2420-108
February 18, 1999

Red-black liquid residue on glove following soil sample collection from Test Pit 1.

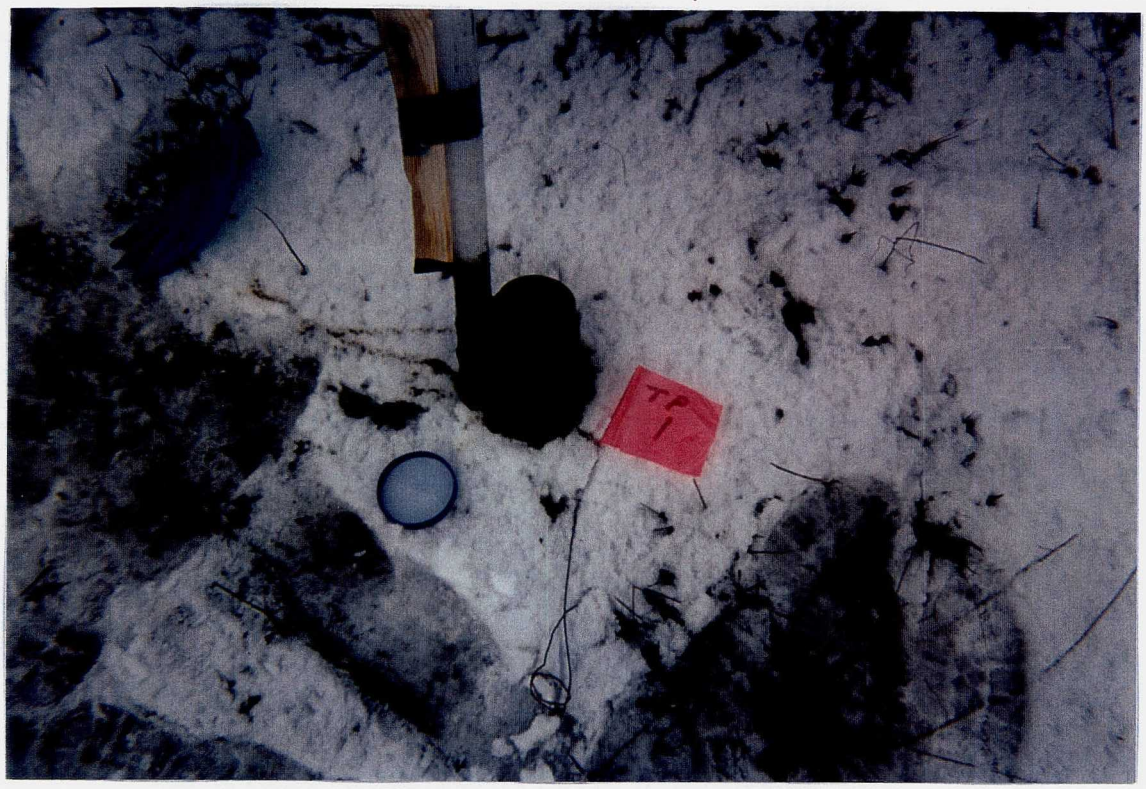
FORMER DETROIT COKE SITE
2420-108
February 25, 1999

Green-yellow liquid collected from Test Pit 9.



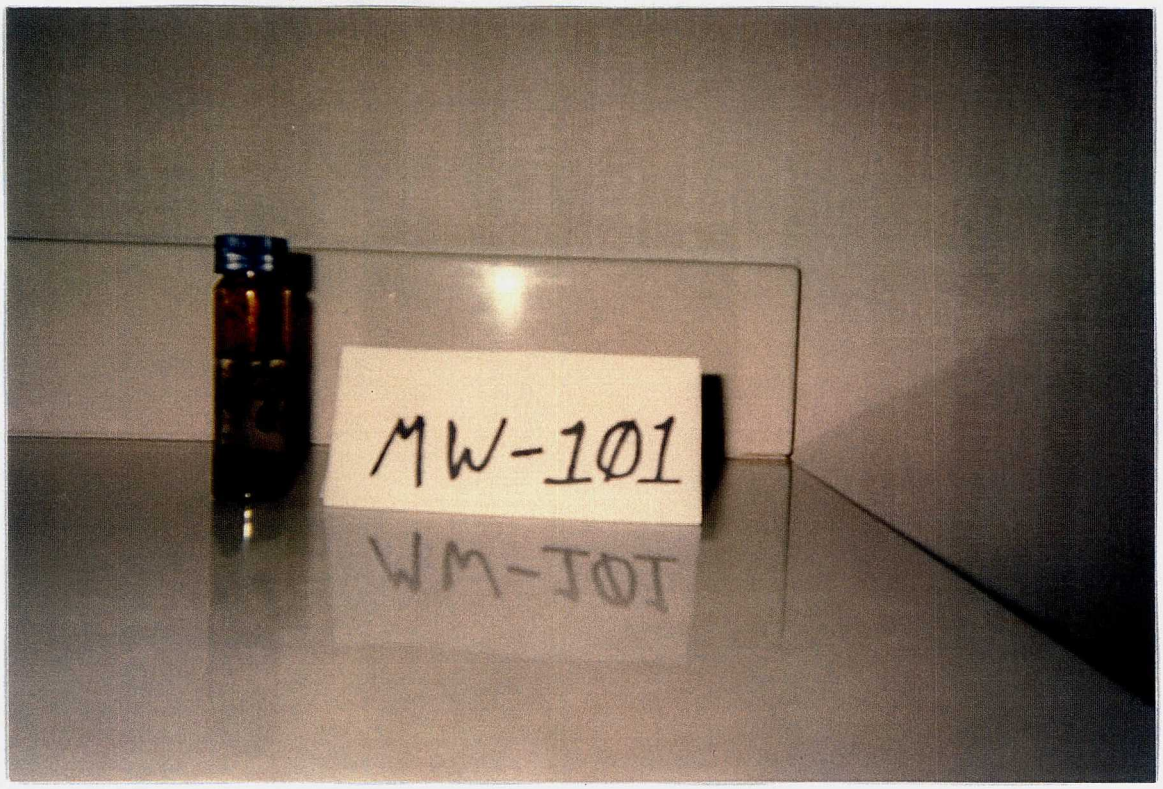
FORMER DETROIT COKE SITE
2420-108
March 4, 1999

Floating product observed on Test Pit 1 prior to test pit pumping.



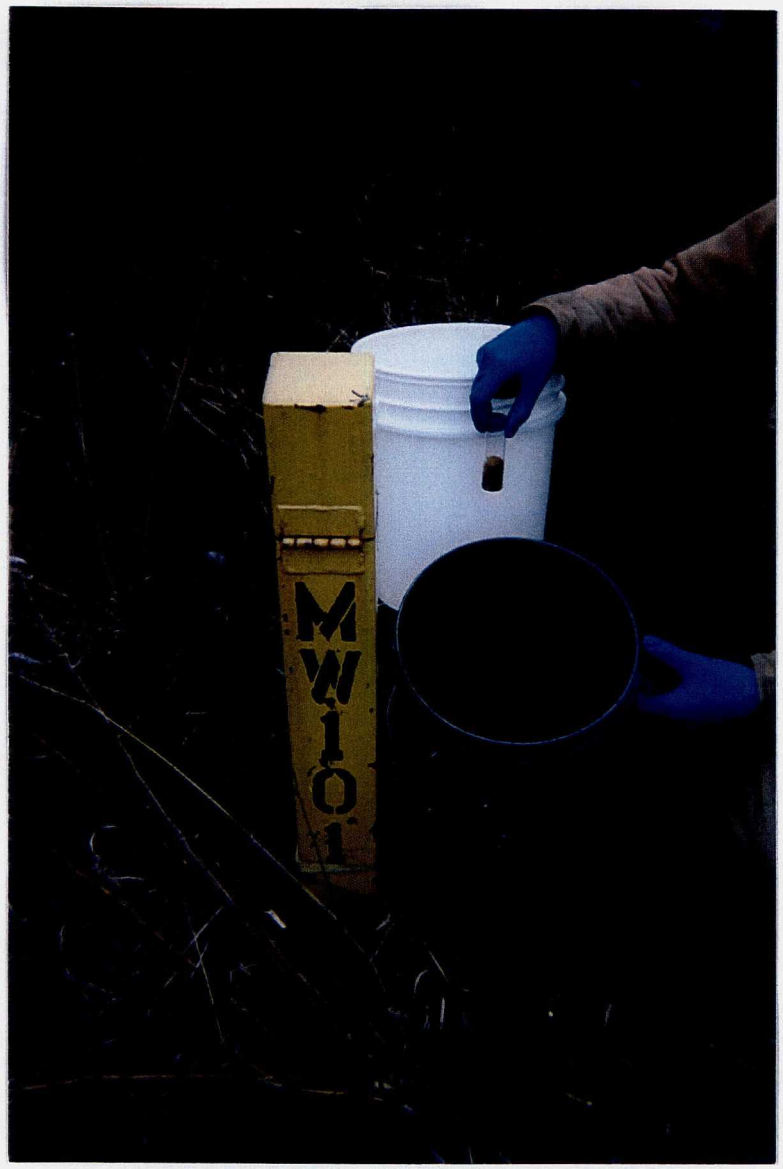
FORMER DETROIT COKE SITE
2420-108
March 4, 1999

Sample jar containing floating product collected from Test Pit 1.



FORMER DETROIT COKE SITE
2420-108
March 3, 1999

Product and water collected from Monitoring Well 101. Note black floating product layer and black sinking product layer over brown silt layer on bottom of sample bottle.



FORMER DETROIT COKE SITE
2420-108
March 3, 1999

Floating product that adhered to a VOA vial dipped into water collected during purging of Monitoring Well 101

FORMER DETROIT COKE SITE
2420-108
March 3, 1999

VOA vial containing product and water recovered from Monitoring Well 101. Note the phase separation between black sinking product and water.

FORMER DETROIT COKE SITE
2420-108
March 3, 1999

Sinking product that accumulated in the purge bucket for Monitoring Well 102.

FORMER DETROIT COKE SITE
2420-108
March 3, 1999

Sampling of sinking product removed during purging of Monitoring Well 6D.

APPENDIX E

SOIL PHYSICAL TESTING DATA

STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project: Malcolm Pirnie
Boring/Source: Detroit Coke
Sample Number: SB-302D
Depth (feet): -
USCS Classification: --
Description: Black and gray orgaic silt with clay. (Visual)

STS Job No.: 73086
Date: 03/16/99
LL: - PL: - PI: -
WC: 23.0 SP.GR.: 2.72 Est.
Cu: - Cc: -
D10: -
D30: -
D60: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 372.20 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
3/8"	.00	.0	100.0
#4	.50	.1	99.9
#8	1.00	.3	99.6
#10	.20	.1	99.5
#16	.50	.1	99.4
#30	1.10	.3	99.1
#40	1.90	.5	98.6
#50	6.20	1.7	96.9
#100	38.50	10.3	86.6
#200	51.20	13.8	72.8

HYDROMETER ANALYSIS --

HYDROMETER SAMPLE WEIGHT: 50.12 GRAMS

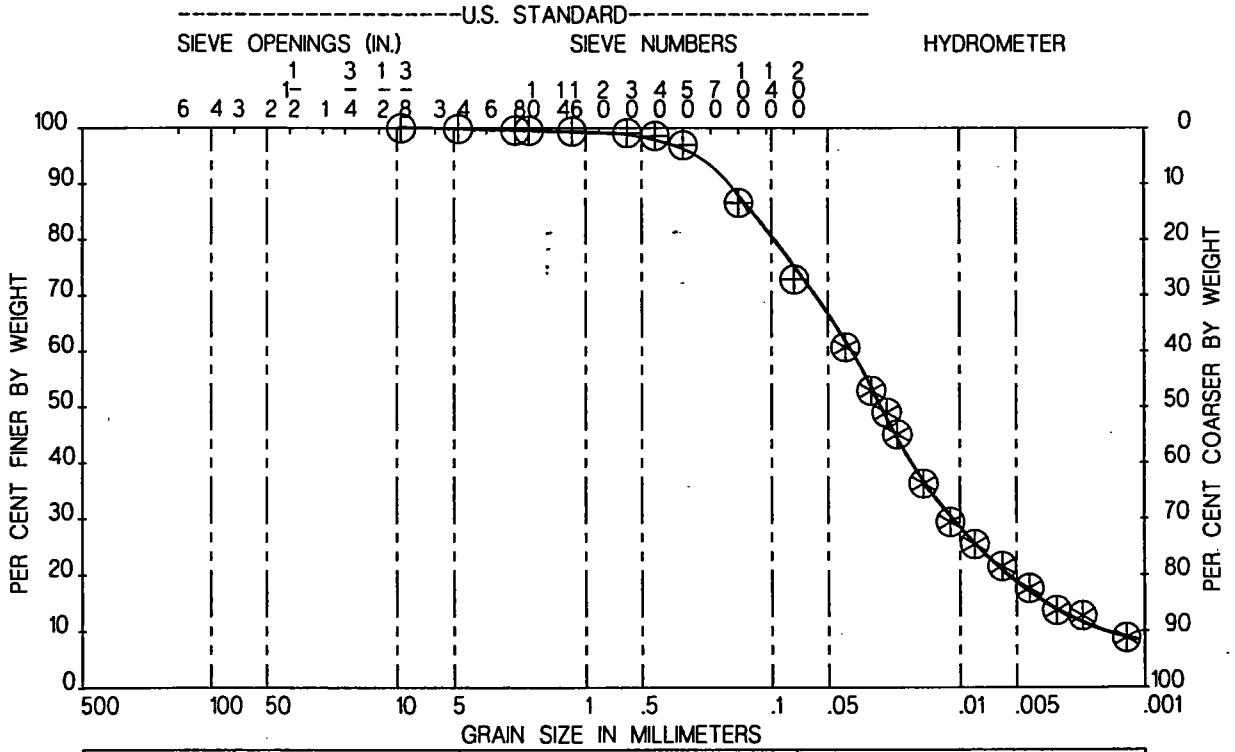
ELAPSED TIME	TEMPERATURE CENTIGRADE	ACTUAL READING	ADJUST READING	GRAIN SIZE	PER CENT FINER
1.00	24.1	38.0	31.0	.0404	60.7
2.00	24.1	34.0	27.0	.0295	52.8
3.00	24.1	32.0	25.0	.0244	48.9
4.00	24.1	30.0	23.0	.0215	45.0
8.00	24.2	25.5	18.5	.0157	36.2
16.00	24.6	22.0	15.0	.0113	29.4
30.00	24.7	20.0	13.0	.0083	25.4
60.00	24.9	18.0	11.0	.0060	21.5
120.00	24.8	16.0	9.0	.0043	17.6
240.00	25.0	14.0	7.0	.0030	13.7
460.00	25.0	13.5	6.5	.0022	12.7
1430.00	25.0	11.5	4.5	.0013	8.8

STS Laboratory Services Group

GRAIN SIZE DISTRIBUTION (ASTM D 422)
STS JOB NO.: *73086*
DATE: *03/16/99*
LL: - **PL:** - **PI:** -
WC: *23.0* **SP.GR.:** *2.72 EST.*

STS CONSULTANTS LTD.

PROJECT: Malcolm Pirnie
BORING/SOURCE: Detroit Coke
SAMPLE NUMBER: SB-302D
DEPTH [FEET]: -
USCS CLASSIFICATION: --
SOIL DESCRIPTION: Black and gray orgaic silt with clay. (Visual)



STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project: Malcolm Pirnie
Boring/Source: Detroit Coke
Sample Number: SB-303D
Depth (feet): 10-12.5
USCS Classification: --
Description: Brown clayey silt, trace sand. (Visual)

STS Job No.: 73086
Date: 03/16/99
LL: - PL: - PI: -
WC: 25.8 SP.GR.: 2.72 Est.
Cu: - Cc: -
D10: -
D30: -
D60: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 393.20 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#10	.00	.0	100.0
#16	.10	.0	100.0
#30	.20	.1	99.9
#40	.20	.1	99.9
#50	.20	.1	99.8
#100	.50	.1	99.7
#200	1.80	.5	99.2

HYDROMETER ANALYSIS --

HYDROMETER SAMPLE WEIGHT: 50.04 GRAMS

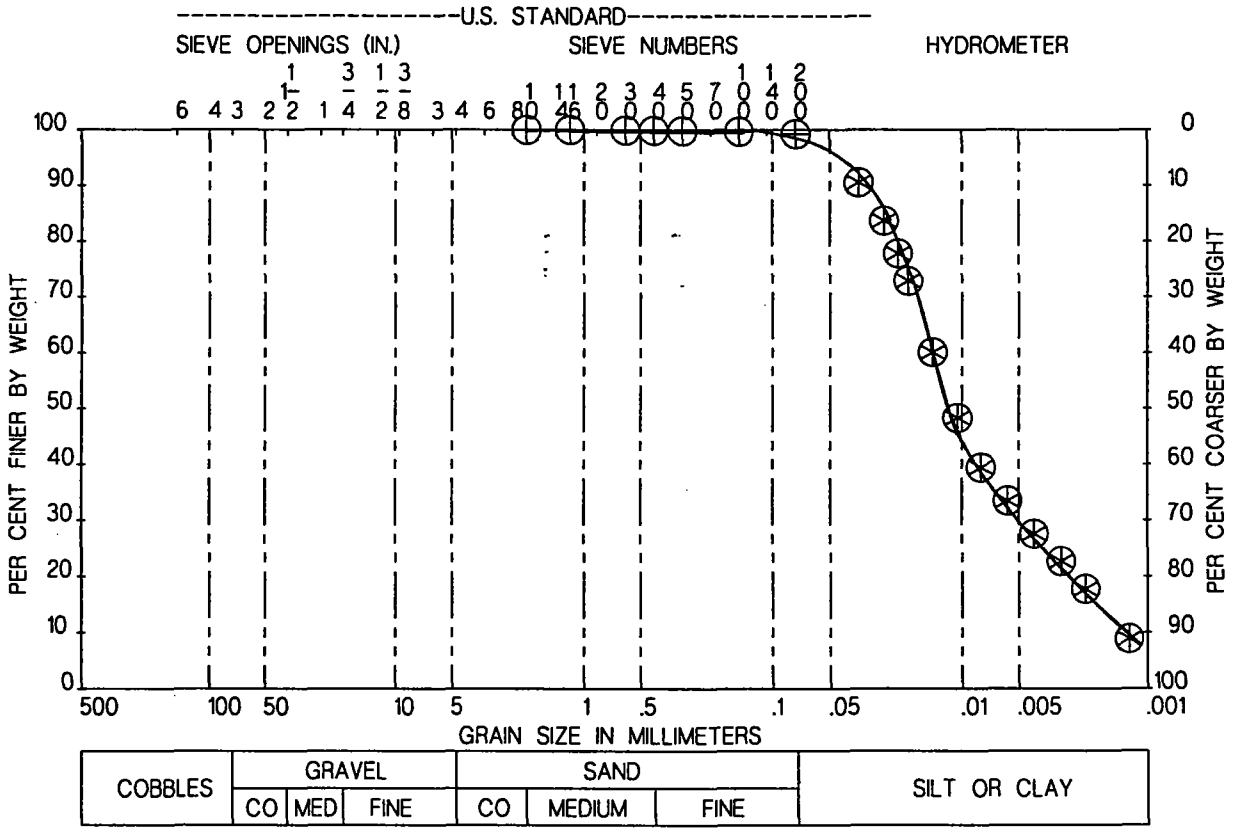
ELAPSED TIME	TEMPERATURE CENTIGRADE	ACTUAL READING	ADJUST READING	GRAIN SIZE	PER CENT FINER
1.00	24.0	53.0	46.0	.0352	90.6
2.00	24.0	49.5	42.5	.0258	83.7
3.00	24.0	46.5	39.5	.0217	77.8
4.00	24.0	44.0	37.0	.0192	72.8
8.00	24.7	37.5	30.5	.0142	60.0
16.00	24.7	31.5	24.5	.0105	48.2
30.00	24.7	27.0	20.0	.0080	39.4
60.00	24.9	24.0	17.0	.0057	33.5
120.00	24.9	21.0	14.0	.0041	27.6
240.00	25.0	18.5	11.5	.0030	22.6
455.00	25.0	16.0	9.0	.0022	17.7
1435.00	25.0	11.5	4.5	.0013	8.9

STS Laboratory Services Group

GRAIN SIZE DISTRIBUTION (ASTM D 422)
STS JOB NO.: *73086*
DATE: *03/16/99*
LL: - **PL:** - **PI:** -
WC: *25.8* **SP.GR.:** *2.72 EST.*

STS CONSULTANTS LTD.

PROJECT: Malcolm Pirnie
BORING/SOURCE: Detroit Coke
SAMPLE NUMBER: SB-303D
DEPTH [FEET]: 10-12.5
USCS CLASSIFICATION: --
SOIL DESCRIPTION: Brown clayey silt, trace sand. (Visual)



STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project: Malcolm Pirnie
Boring/Source: Detroit Coke
Sample Number: SB-306D
Depth (feet): 9.5-12
USCS Classification: --
Description: Black and gray clayey silt, little sand and organics. (Visual)

STS Job No.: 73086
Date: 03/16/99
LL: - PL: - PI: -
WC: 32.8 SP.GR.: 2.72 Est.
Cu: - Cc: -
D10: -
D30: -
D60: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 343.00 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
#8	.00	.0	100.0
#10	.30	.1	99.9
#16	.50	.1	99.8
#30	1.90	.6	99.2
#40	2.50	.7	98.5
#50	3.80	1.1	97.4
#100	12.80	3.7	93.6
#200	37.50	10.9	82.7

HYDROMETER ANALYSIS --

HYDROMETER SAMPLE WEIGHT: 50.24 GRAMS

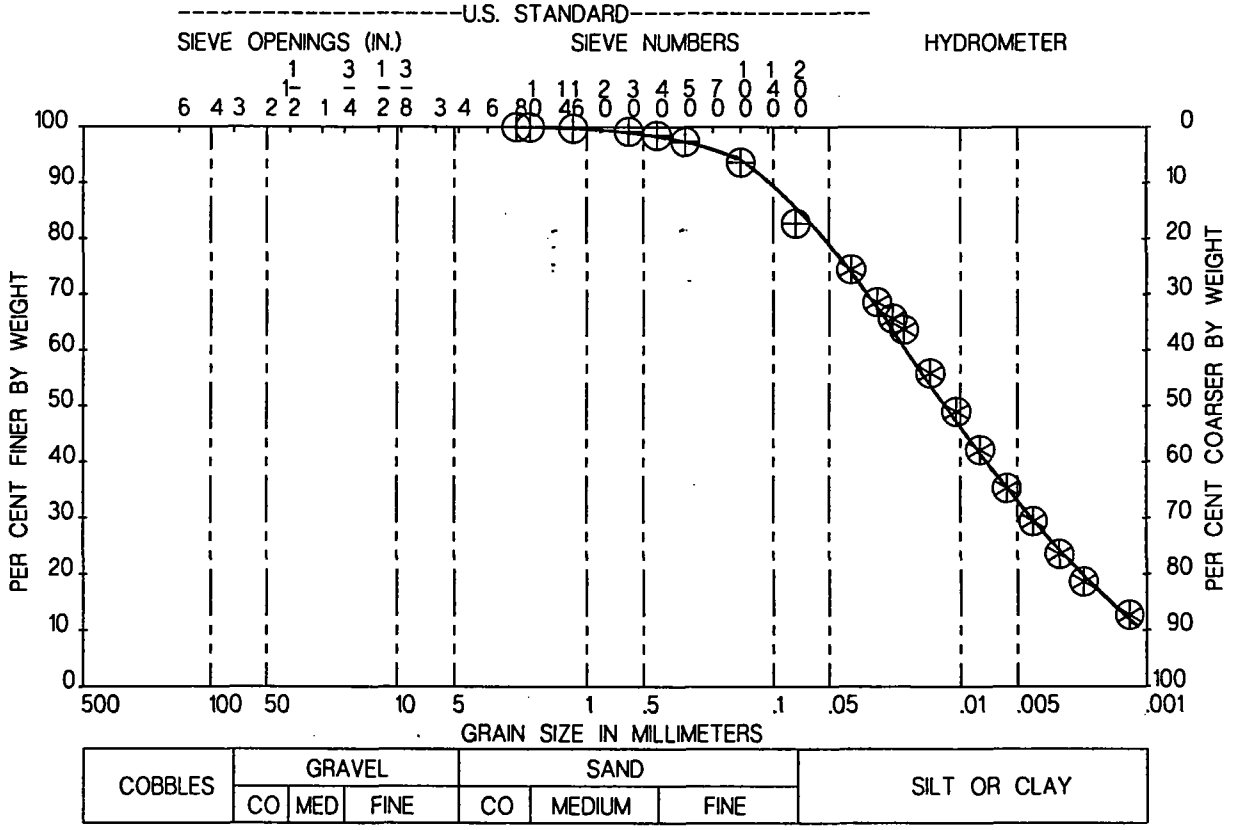
ELAPSED TIME	TEMPERATURE CENTIGRADE	ACTUAL READING	ADJUST READING	GRAIN SIZE	PER CENT FINER
1.00	23.9	45.0	38.0	.0381	74.5
2.00	23.9	42.0	35.0	.0277	68.6
3.00	23.9	40.5	33.5	.0229	65.6
4.00	23.9	39.5	32.5	.0200	63.7
8.00	24.7	35.5	28.5	.0145	55.8
16.00	24.5	32.0	25.0	.0105	49.0
30.00	24.7	28.5	21.5	.0079	42.1
60.00	24.9	25.0	18.0	.0057	35.3
120.00	25.0	22.0	15.0	.0041	29.4
240.00	25.0	19.0	12.0	.0030	23.5
445.00	25.0	16.5	9.5	.0022	18.6
1445.00	25.0	13.5	6.5	.0012	12.7

STS Laboratory Services Group

GRAIN SIZE DISTRIBUTION (ASTM D 422)
STS JOB NO.: *73086*
DATE: *03/16/99*
LL: - **PL:** - **PI:** -
WC: *32.8* **SP.GR.:** *2.72 EST.*

STS CONSULTANTS LTD.

PROJECT: Malcolm Pirnie
BORING/SOURCE: Detroit Coke
SAMPLE NUMBER: SB-306D
DEPTH [FEET]: 9.5-12
USCS CLASSIFICATION: --
SOIL DESCRIPTION: Black and gray clayey silt, little sand and organics. (Visual)



STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project: Malcolm Pirnie
Boring/Source: Detroit Coke
Sample Number: SB-312
Depth (feet): 15-17
USCS Classification: --
Description: Grayish brown clayey sand with silt, trce fine gravel. (Visual)

STS Job No.: 73086
Date: 03/16/99
LL: - PL: - PI: -
WC: 18.6 SP.GR.: 2.70 Est.
Cu: - Cc: -
D10: -
D30: -
D60: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 516.40 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
3/8"	.00	.0	100.0
#4	8.90	1.7	98.3
#8	17.80	3.4	94.8
#10	6.00	1.2	93.7
#16	20.10	3.9	89.8
#30	48.60	9.4	80.4
#40	64.90	12.6	67.8
#50	74.30	14.4	53.4
#100	79.30	15.4	38.1
#200	26.30	5.1	33.0

HYDROMETER ANALYSIS --

HYDROMETER SAMPLE WEIGHT: 50.19 GRAMS

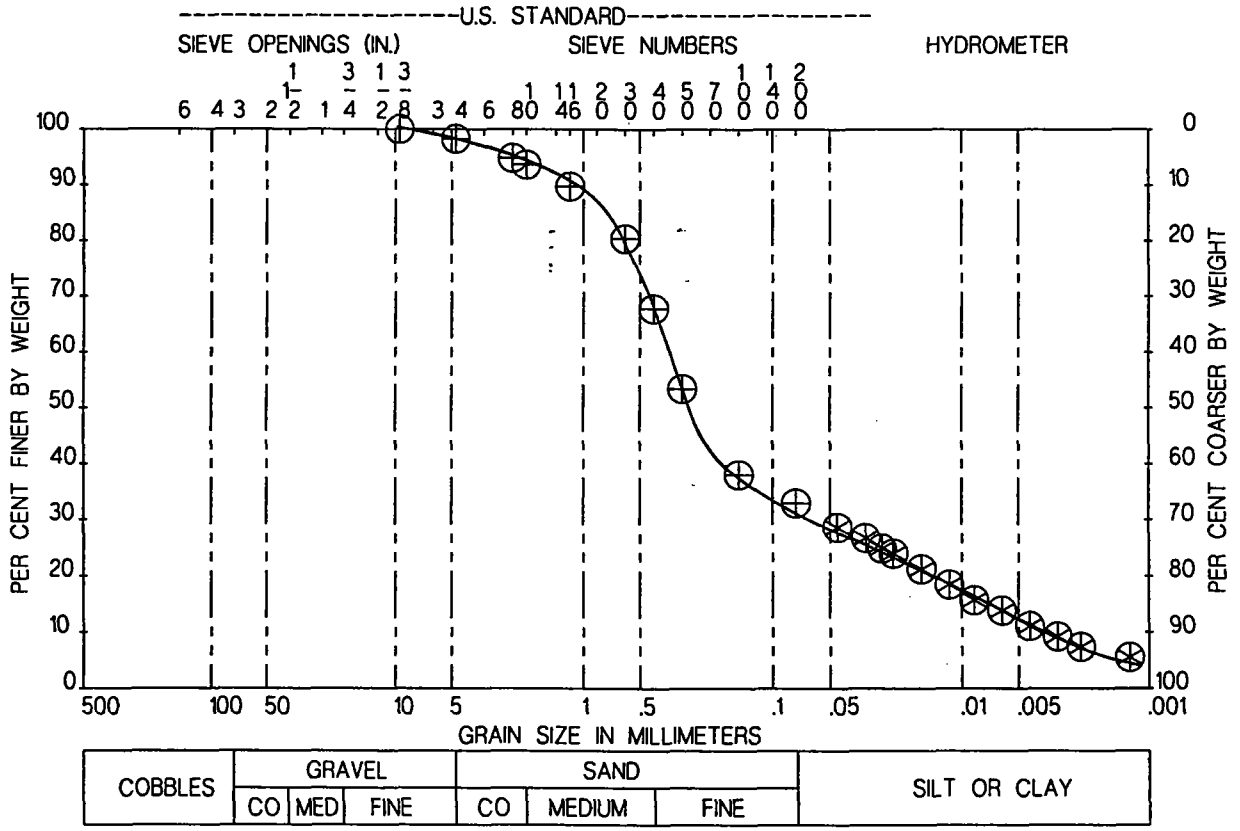
ELAPSED TIME	TEMPERATURE CENTIGRADE	ACTUAL READING	ADJUST READING	GRAIN SIZE	PER CENT FINER
1.00	24.0	22.5	15.5	.0455	28.6
2.00	24.0	21.5	14.5	.0324	26.8
3.00	24.0	20.5	13.5	.0266	24.9
4.00	24.0	20.0	13.0	.0231	24.0
8.00	24.3	18.5	11.5	.0165	21.2
16.00	24.6	17.0	10.0	.0117	18.5
30.00	24.8	15.5	8.5	.0086	15.7
60.00	24.9	14.5	7.5	.0061	13.8
120.00	24.9	13.0	6.0	.0044	11.1
240.00	25.0	12.0	5.0	.0031	9.2
435.00	25.0	11.0	4.0	.0023	7.4
1455.00	25.0	10.0	3.0	.0013	5.5

STS Laboratory Services Group

GRAIN SIZE DISTRIBUTION (ASTM D 422)
STS JOB NO.: *73086*
DATE: *03/16/99*
LL: - **PL:** - **PI:** -
WC: *18.6* **SP.GR.:** *2.70 EST.*

STS CONSULTANTS LTD.

PROJECT: Malcolm Pirnie
BORING/SOURCE: Detroit Coke
SAMPLE NUMBER: SB-312
DEPTH [FEET]: 15-17
USCS CLASSIFICATION: --
SOIL DESCRIPTION: Grayish brown clayey sand with silt, trce fine gravel. (Visual)



STS CONSULTANTS, LTD.

GRAIN SIZE DISTRIBUTION (ASTM D 422)

Project: Malcolm Pirnie
Boring/Source: Detroit Coke
Sample Number: SB-312D
Depth (feet): 17-19
USCS Classification: --
Description: Gray clayey silt, some sand, trace fine gravel. (Visual)

STS Job No.: 73086
Date: 03/16/99
LL: - PL: - PI: -
WC: 23.8 SP.GR.: 2.72 Est.
Cu: - Cc: -
D10: -
D30: -
D60: -

SIEVE ANALYSIS --

SAMPLE WEIGHT: 463.00 GRAMS

SIEVE SIZE	WEIGHT RETAINED	PER CENT RETAINED	PER CENT PASSING
3/8"	.00	.0	100.0
#4	.70	.2	99.8
#8	1.60	.3	99.5
#10	.80	.2	99.3
#16	2.10	.5	98.9
#30	7.20	1.6	97.3
#40	10.20	2.2	95.1
#50	21.10	4.6	90.6
#100	39.70	8.6	82.0
#200	35.20	7.6	74.4

HYDROMETER ANALYSIS --

HYDROMETER SAMPLE WEIGHT: 49.95 GRAMS

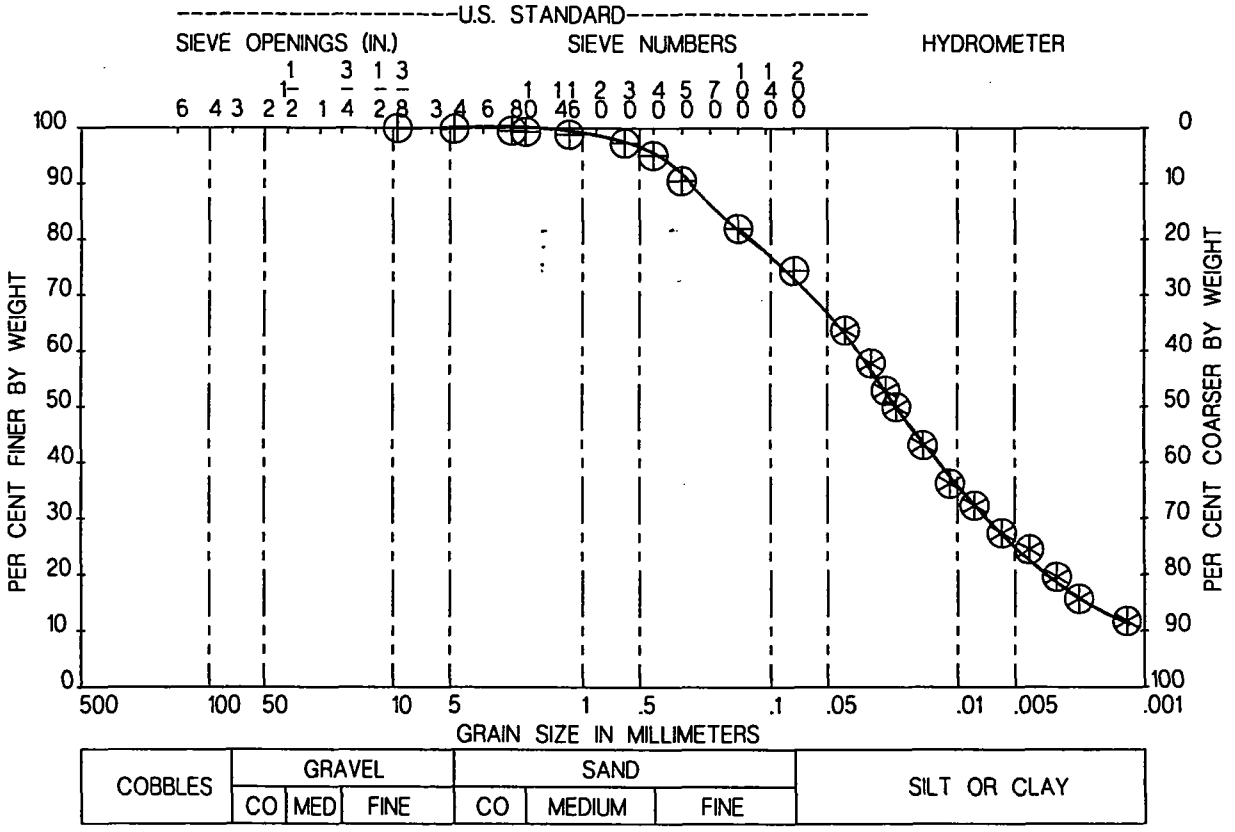
ELAPSED TIME	TEMPERATURE CENTIGRADE	ACTUAL READING	ADJUST READING	GRAIN SIZE	PER CENT FINER
1.00	23.8	39.5	32.5	.0401	63.7
2.00	23.8	36.5	29.5	.0290	57.8
3.00	23.8	34.0	27.0	.0242	52.9
4.00	23.8	32.5	25.5	.0212	50.0
8.00	24.2	29.0	22.0	.0153	43.1
16.00	24.6	25.5	18.5	.0110	36.2
30.00	24.8	23.5	16.5	.0081	32.3
60.00	24.9	21.0	14.0	.0058	27.4
120.00	25.0	19.5	12.5	.0042	24.5
240.00	25.0	17.0	10.0	.0030	19.6
425.00	25.0	15.0	8.0	.0023	15.7
1440.00	25.0	13.0	6.0	.0012	11.8

STS Laboratory Services Group

GRAIN SIZE DISTRIBUTION (ASTM D 422)
STS JOB NO.: *73086*
DATE: *03/16/99*
LL: - **PL:** - **PI:** -
WC: *23.8* **SP.GR.:** *2.72 EST.*

STS CONSULTANTS LTD.

PROJECT: Malcolm Pirnie
BORING/SOURCE: Detroit Coke
SAMPLE NUMBER: SB-312D
DEPTH [FEET]: 17-19
USCS CLASSIFICATION: --
SOIL DESCRIPTION: Gray clayey silt, some sand, trace fine gravel. (Visual)



STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

STS PROJECT NO.: 73086

PROJECT: Malcolm Pirnie

DATE: 3/16/99

SUMMARY OF TEST RESULTS

SAMPLE NO.	SB-302D		
LOCATION	Detroit Coke		
CLASSIFICATION	Black and gray organic silt with clay. (Visual)		
		INITIAL	FINAL
DRY UNIT WEIGHT (pcf)		106.0	110.8
WATER CONTENT (%)		23.0	19.6
DIAMETER (cm)		7.12	7.07
LENGTH (cm)		6.74	6.62
HYDRAULIC GRADIENT (MAXIMUM)	24.6		
PERCENT SATURATION	100.8	(Percent saturation calculation is based on final measurements and an estimated specific gravity.)	
HYDRAULIC CONDUCTIVITY k (cm/sec)	8.7E-07		

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
Rising tailwater method in a triaxial permeameter
ASTM D 5084, Method C (EM-1110-2-1906 7)

Project Name: Malcolm Pirnie
Project No.: 73086
Project Location: Detroit Coke
Sample No.: SB-302D
Sample Location:

Sample Description: Black and gray organic silt with clay. (Visual)

Cell No.: 1

Date Sampled:
Date Received:

MOISTURE CONTENT	INITIAL	FINAL
Container No.	99	A12
Wet Sample & Tare (g)	633.20	199.74
Dry Sample & Tare (g)	533.70	181.48
Wt. Water (g)	99.50	18.26
Wt. Tare (g)	100.80	88.31
Wt. Dry Soil (g)	432.90	93.17
Water Content, w (%)	23.0	19.6

SATURATION DATA

Initial Cell Pressure (psi)	Final Cell Pressure (psi)	Initial PWP (psi)	Final PWP (psi)	B Value

Final B value =

SPECIMEN INFORMATION	INITIAL	FINAL
Avg. Diameter (cm)	7.12	7.07
Avg. Height, L (cm)	6.74	6.62
X-Section Area, A (cm^2)	39.793	39.225
Specimen wet wt. (g)	560.58	551.77
Specimen Dry wt., W_s (g)	455.81	461.35
Total Volume, V (cm^3)	268.32	259.83
Dry Unit Weight (lbs/ft^3)	106.0	110.8
G_s estimated (Y or N)?	Y	Gs est.
Specific Gravity, G_s	2.720	2.720
Volume Solids, V_s (cm^3)	167.91	169.95
Pore Volume (cm^3)	100.41	89.87
Void Ratio, e	0.598	0.529
Degree of Saturation	104.5	100.8

COMMENTS:

NOTE:
Deaired tap water was used as liquid permeant.

$$\text{Volume Solids} = \frac{W_s}{(G_s)(\text{Water Density})}$$

$$\text{Void Ratio} = \frac{V - V_s}{V_s}$$

$$\text{Degree of Saturation} = \frac{(w)(G_s)}{e}$$

Proj Name: Malcolm Pirnie
Proj No.: 73086
Sample: SB-302D

k (cm/sec)	Max i
10^{-3} to 10^{-4}	2
10^{-4} to 10^{-5}	5
10^{-5} to 10^{-6}	10
10^{-6} to 10^{-7}	20
less than 10^{-7}	30

Hydraulic Gradient, i, Guidlines as per ASTM D5084, section 8.5.1

TEST CONDITIONS

Influent Burette Area a_{in} (cm^2)	Effluent Burette Area a_{out} (cm^2)	# ascend as burette empties? (Y or N)
1.00	1.00	Y

Cell Pressure (psi)	Headwater Pressure (psi)	Tailwater Pressure (psi)	Driving Head (psi)	Hydraulic Gradient Max	Hydraulic Gradient Min
64.0	60.0	58.0	2.0	24.6	18.0

TEST DATA

Timer Reading (min.)	Temp. °C	Elapsed Time, t (sec)	Influent Reading (cm)	Effluent Reading (cm)	Total Change (cm)	Inflow to Outflow Ratio	Hydraulic Head, h (cm)	k, Hydraulic Conductivity (cm/sec)	k_{20} corrected for temperature (cm/sec)
0	22.0	0	0.0	25.0	0.0	0.00	165.6	0	0
36	22.0	2160	2.4	22.2	0.4	0.86	160.4	1.25E-06	1.19E-06
66	22.0	1800	4.2	20.2	0.2	0.90	156.6	1.13E-06	1.08E-06
100	22.0	2040	6.1	18.4	-0.1	1.06	152.9	9.93E-07	9.46E-07
150	23.0	3000	8.6	15.7	0.2	0.93	147.7	9.77E-07	9.21E-07
219	24.0	4140	12.1	12.3	-0.1	1.03	140.8	9.79E-07	9.01E-07
310	25.0	5460	16.3	8.1	0.0	1.00	132.4	9.55E-07	8.59E-07
444	25.0	8040	21.8	2.6	0.0	1.00	121.4	9.14E-07	8.13E-07
						(0.75-1.25)		Final Value	8.73E-07

$$k_{20} = \frac{(a_{in})(a_{out})L[\ln(h_{n-1}/h_n)]*R_T}{At(a_{in} + a_{out})}$$

Total Change = $(Eff_{n-1} - Eff_n) - (Inf_n - Inf_{n-1})$

"Hydraulic Head" incorporates the difference in head as well as the added driving head pressure.
"Total Change" is the difference between the Effluent change from t_0 to t_1 and the Influent change from t_0 to t_1.

Notate temperature to the nearest half a degree. The correction calculation averages the two consecutive readings.
k is multiplied by the temperature correction, R_T, which is the ratio of the viscosity of water at test temperature to the viscosity of water at 20° C. Temperature range may be between 19° and 25° for formula calculation.
"Final Value" is the average of 4 consecutive readings of which none are less than or greater than 25% of their average. (50% of average if $k < 1 \times 10^{-8}$)

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

STS PROJECT NO.: 73086

PROJECT: Malcolm Pirnie

DATE: 3/18/99

SUMMARY OF TEST RESULTS

SAMPLE NO.	SB-302D
LOCATION	Detroit Coke
CLASSIFICATION	Brown and black clayey silt, trace organics. (Visual)

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	103.0	108.0
WATER CONTENT (%)	24.5	21.6
DIAMETER (cm)	7.11	7.08
LENGTH (cm)	7.13	6.85

HYDRAULIC GRADIENT (MAXIMUM)	23.2	
PERCENT SATURATION	103.4	(Percent saturation calculation is based on final measurements and an estimated specific gravity.)
HYDRAULIC CONDUCTIVITY k (cm/sec)	6.7E-07	

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
Rising tailwater method in a triaxial permeameter
ASTM D 5084, Method C (EM-1110-2-1906 7)

Project Name: Malcolm Pirnie
Project No.: 73086
Project Location: Detroit Coke
Sample No.: SB-302D
Sample Location:

Sample Description: Brown and black clayey silt, trace organics. (Visual)

Cell No.: 1

Date Sampled:
Date Received:

MOISTURE CONTENT	INITIAL	FINAL
Container No.	A12	A101
Wet Sample & Tare (g)	219.74	185.35
Dry Sample & Tare (g)	193.90	167.98
Wt. Water (g)	25.84	17.37
Wt. Tare (g)	88.30	87.66
Wt. Dry Soil (g)	105.60	80.32
Water Content, w (%)	24.5	21.6

SATURATION DATA

Initial Cell Pressure (psi)	Final Cell Pressure (psi)	Initial PWP (psi)	Final PWP (psi)	B Value
			Final B value =	

SPECIMEN INFORMATION	INITIAL	FINAL
Avg. Diameter (cm)	7.11	7.08
Avg. Height, L (cm)	7.13	6.85
X-Section Area, **A** (cm^2)	39.659	39.369
Specimen wet wt. (g)	580.52	567.09
Specimen Dry wt., W_s (g)	466.39	466.26
Total Volume, **V** (cm^3)	282.57	269.48
Dry Unit Weight (lbs/ft^3)	103.0	108.0
G_s estimated (Y or N)?	Y	Gs est.
Specific Gravity, G_s	2.720	2.720
Volume Solids, V_s (cm^3)	171.81	171.76
Pore Volume (cm^3)	110.76	97.72
Void Ratio, e	0.645	0.569
Degree of Saturation	103.2	103.4

$$\text{Volume Solids} = \frac{W_s}{(G_s)(\text{Water Density})}$$

$$\text{Void Ratio} = \frac{V - V_s}{V_s}$$

$$\text{Degree of Saturation} = \frac{(w)(G_s)}{e}$$

COMMENTS:

NOTE:
Deaired tap water was used as liquid permeant.

Proj Name: Malcolm Pirnie
Proj No.: 73086
Sample: SB-302D

k (cm/sec)	Max i
10^{-3} to 10^{-4}	2
10^{-4} to 10^{-5}	5
10^{-5} to 10^{-6}	10
10^{-6} to 10^{-7}	20
less than 10^{-7}	30

Hydraulic Gradient, i, Guidlines as per ASTM D5084, section 8.5.1

TEST CONDITIONS

Influent Burette Area a_{in} (cm^2)	Effluent Burette Area a_{out} (cm^2)	# ascend as burette empties? (Y or N)
1.00	1.00	Y

Cell Pressure (psi)	Headwater Pressure (psi)	Tailwater Pressure (psi)	Driving Head (psi)	Hydraulic Gradient Max	Hydraulic Gradient Min
64.0	60.0	58.0	2.0	23.2	17.6

TEST DATA

Timer Reading (min.)	Temp. °C	Elapsed Time, t (sec)	Influent Reading (cm)	Effluent Reading (cm)	Total Change (cm)	Inflow to Outflow Ratio	Hydraulic Head, h (cm)	k, Hydraulic Conductivity (cm/sec)	k_{20} corrected for temperature (cm/sec)
0	22.0	0	0.0	25.0	0.0	0.00	165.6	0	0
37	22.0	2220	1.9	22.8	0.3	0.86	161.5	1.01E-06	9.67E-07
78	22.0	2460	3.8	20.7	0.2	0.90	157.5	9.16E-07	8.73E-07
122	22.5	2640	5.7	18.8	0.0	1.00	153.7	8.31E-07	7.87E-07
204	23.0	4920	9.0	15.5	0.0	1.00	147.1	8.01E-07	7.51E-07
320	25.0	6960	13.0	11.3	0.2	0.95	138.9	7.40E-07	6.73E-07
447	25.0	7620	17.0	7.2	0.1	0.98	130.8	7.08E-07	6.30E-07
537	25.0	5400	19.7	4.6	-0.1	1.04	125.5	6.88E-07	6.12E-07
						(0.75-1.25)		Final Value	6.66E-07

$$k_{20} = \frac{(a_{in})(a_{out})L[\ln(h_{n-1}/h_n)]*R_T}{At(a_{in} + a_{out})}$$

Total Change = $(Eff_{n-1} - Eff_n) - (Inf_n - Inf_{n-1})$

"Hydraulic Head" incorporates the difference in head as well as the added driving head pressure.
"Total Change" is the difference between the Effluent change from t_0 to t_1 and the Influent change from t_0 to t_1.

Notate temperature to the nearest half a degree. The correction calculation averages the two consecutive readings.
k is multiplied by the temperature correction, R_T, which is the ratio of the viscosity of water at test temperature to the viscosity of water at 20° C. Temperature range may be between 19° and 25° for formula calculation.
"Final Value" is the average of 4 consecutive readings of which none are less than or greater than 25% of their average. (50% of average if $k < 1 \times 10^{-8}$)

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

STS PROJECT NO.: 73086

PROJECT: Malcolm Pirnie

DATE: 3/17/99

SUMMARY OF TEST RESULTS

SAMPLE NO. SB-303D

LOCATION Detroit Coke

CLASSIFICATION Brown clayey silt, trace sand. (Visual)

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	101.8	105.9
WATER CONTENT (%)	25.8	22.5
DIAMETER (cm)	7.29	7.17
LENGTH (cm)	7.08	7.03

HYDRAULIC GRADIENT (MAXIMUM) 23.4

PERCENT SATURATION 102.1 (Percent saturation calculation is based on final measurements and an estimated specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec) 1.5E-07

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
Rising tailwater method in a triaxial permeameter
ASTM D 5084, Method C (EM-1110-2-1906 7)

Project Name: Malcolm Pirnie
Project No.: 73086
Project Location: Detroit Coke
Sample No.: SB-303D
Sample Location: 10'-12.5'

Sample Description: Brown clayey silt, trace sand. (Visual)

Cell No.: 2

Date Sampled:
Date Received:

MOISTURE CONTENT	INITIAL	FINAL
Container No.	33	A101
Wet Sample & Tare (g)	658.40	230.58
Dry Sample & Tare (g)	543.80	204.32
Wt. Water (g)	114.60	26.26
Wt. Tare (g)	100.40	87.64
Wt. Dry Soil (g)	443.40	116.68
Water Content, **w** (%)	25.8	22.5

SATURATION DATA

Initial Cell Pressure (psi)	Final Cell Pressure (psi)	Initial PWP (psi)	Final PWP (psi)	B Value
			Final B value =	

SPECIMEN INFORMATION	INITIAL	FINAL
Avg. Diameter (cm)	7.29	7.17
Avg. Height, **L** (cm)	7.08	7.03
X-Section Area, **A** (cm^2)	41.694	40.377
Specimen wet wt. (g)	605.76	590.42
Specimen Dry wt., W_s (g)	481.35	481.95
Total Volume, **V** (cm^3)	295.15	284.01
Dry Unit Weight (lbs/ft^3)	101.8	105.9
G_s estimated (Y or N)?	Y	Gs est.
Specific Gravity, G_s	2.720	2.720
Volume Solids, V_s (cm^3)	177.32	177.54
Pore Volume (cm^3)	117.83	106.47
Void Ratio, **e**	0.664	0.600
Degree of Saturation	105.8	102.1

COMMENTS:

NOTE:
Deaired tap water was used as liquid permeant.

$$\text{Volume Solids} = \frac{W_s}{(G_s)(\text{Water Density})}$$

$$\text{Void Ratio} = \frac{V - V_s}{V_s}$$

$$\text{Degree of Saturation} = \frac{(w)(G_s)}{e}$$

Proj Name: Malcolm Pirnie
Proj No.: 73086
Sample: SB-303D

k (cm/sec)	Max i
10^{-3} to 10^{-4}	2
10^{-4} to 10^{-5}	5
10^{-5} to 10^{-6}	10
10^{-6} to 10^{-7}	20
less than 10^{-7}	30

Hydraulic Gradient, i, Guidlines as per ASTM D5084, section 8.5.1

TEST CONDITIONS

Influent Burette Area a_{in} (cm^2)	Effluent Burette Area a_{out} (cm^2)	# ascend as burette empties? (Y or N)
1.00	1.00	Y

Cell Pressure (psi)	Headwater Pressure (psi)	Tailwater Pressure (psi)	Driving Head (psi)	Hydraulic Gradient Max	Hydraulic Gradient Min
64.0	60.0	58.0	2.0	23.4	18.7

TEST DATA

Timer Reading (min.)	Temp. °C	Elapsed Time, t (sec)	Influent Reading (cm)	Effluent Reading (cm)	Total Change (cm)	Inflow to Outflow Ratio	Hydraulic Head, h (cm)	k, Hydraulic Conductivity (cm/sec)	k_{20} corrected for temperature (cm/sec)
0	22.0	0	0.0	25.0	0.0	0.00	165.6	0	0
66	22.0	3960	0.6	24.2	0.2	0.75	164.2	1.82E-07	1.73E-07
150	23.0	5040	1.4	23.4	0.0	1.00	162.6	1.65E-07	1.55E-07
342	25.0	11520	3.2	21.5	0.1	0.95	158.9	1.70E-07	1.54E-07
490	25.0	8880	4.6	20.1	0.0	1.00	156.1	1.70E-07	1.51E-07
1432	22.0	56520	13.0	11.5	0.2	0.98	139.1	1.73E-07	1.59E-07
1595	23.0	9780	14.4	10.3	-0.2	1.17	136.5	1.64E-07	1.54E-07
1848	25.5	15180	16.4	8.3	0.0	1.00	132.5	1.66E-07	1.50E-07
						(0.75-1.25)		Final Value	1.54E-07

$$k_{20} = \frac{(a_{in})(a_{out})L[\ln(h_{n-1}/h_n)]*R_T}{At(a_{in} + a_{out})}$$

Total Change = $(Eff_{n-1} - Eff_n) - (Inf_n - Inf_{n-1})$

"Hydraulic Head" incorporates the difference in head as well as the added driving head pressure.
"Total Change" is the difference between the Effluent change from t_0 to t_1 and the Influent change from t_0 to t_1.

Notate temperature to the nearest half a degree. The correction calculation averages the two consecutive readings.
k is multiplied by the temperature correction, R_T, which is the ratio of the viscosity of water at test temperature to the viscosity of water at 20° C. Temperature range may be between 19° and 25° for formula calculation.
"Final Value" is the average of 4 consecutive readings of which none are less than or greater than 25% of their average. (50% of average if $k < 1 \times 10^{-8}$)

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

STS PROJECT NO.: 73086

PROJECT: Malcolm Pirnie

DATE: 3/17/99

SUMMARY OF TEST RESULTS

SAMPLE NO.	SB-306D		
LOCATION	Detroit Coke		
CLASSIFICATION	Black and gray clayey silt, little sand and organics. (Visual)		
		INITIAL	FINAL
DRY UNIT WEIGHT (pcf)		88.3	93.3
WATER CONTENT (%)		32.8	30.3
DIAMETER (cm)		7.17	7.11
LENGTH (cm)		7.05	6.75
HYDRAULIC GRADIENT (MAXIMUM)	23.5		
PERCENT SATURATION	101.1	(Percent saturation calculation is based on final measurements and an estimated specific gravity.)	
HYDRAULIC CONDUCTIVITY k (cm/sec)	1.2E-07		

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
Rising tailwater method in a triaxial permeameter
ASTM D 5084, Method C (EM-1110-2-1906 7)

Project Name: Malcolm Pirnie
Project No.: 73086
Project Location: Detroit Coke
Sample No.: SB-306D
Sample Location: 9.5'-12'

Sample Description: Black and gray clayey silt, little sand and organics. (Visual)

Cell No.: 3

Date Sampled:
Date Received:

MOISTURE CONTENT	INITIAL	FINAL
Container No.	36	A13
Wet Sample & Tare (g)	629.60	208.64
Dry Sample & Tare (g)	498.60	179.90
Wt. Water (g)	131.00	28.74
Wt. Tare (g)	99.30	85.02
Wt. Dry Soil (g)	399.30	94.88
Water Content, **w** (%)	32.8	30.3

SATURATION DATA

Initial Cell Pressure (psi)	Final Cell Pressure (psi)	Initial PWP (psi)	Final PWP (psi)	B Value
			Final B value =	

SPECIMEN INFORMATION	INITIAL	FINAL
Avg. Diameter (cm)	7.17	7.11
Avg. Height, **L** (cm)	7.05	6.75
X-Section Area, **A** (cm^2)	40.377	39.704
Specimen wet wt. (g)	534.61	522.46
Specimen Dry wt., W_s (g)	402.55	401.00
Total Volume, **V** (cm^3)	284.57	268.16
Dry Unit Weight (lbs/ft^3)	88.3	93.3
G_s estimated (Y or N)?	Y	Gs est.
Specific Gravity, G_s	2.720	2.720
Volume Solids, V_s (cm^3)	148.29	147.72
Pore Volume (cm^3)	136.28	120.44
Void Ratio, **e**	0.919	0.815
Degree of Saturation	97.1	101.1

$$\text{Volume Solids} = \frac{W_s}{(G_s)(\text{Water Density})}$$

$$\text{Void Ratio} = \frac{V - V_s}{V_s}$$

$$\text{Degree of Saturation} = \frac{(w)(G_s)}{e}$$

COMMENTS:

Proj Name: Malcolm Pirnie
Proj No.: 73086
Sample: SB-306D

k (cm/sec)	Max i
10^{-3} to 10^{-4}	2
10^{-4} to 10^{-5}	5
10^{-5} to 10^{-6}	10
10^{-6} to 10^{-7}	20
less than 10^{-7}	30

Hydraulic Gradient, i, Guidlines as per ASTM D5084, section 8.5.1

TEST CONDITIONS

Influent Burette Area a_{in} (cm^2)	Effluent Burette Area a_{out} (cm^2)	# ascend as burette empties? (Y or N)
1.00	1.00	Y

Cell Pressure (psi)	Headwater Pressure (psi)	Tailwater Pressure (psi)	Driving Head (psi)	Hydraulic Gradient Max	Hydraulic Gradient Min
64.0	60.0	58.0	2.0	23.5	19.8

TEST DATA

Timer Reading (min.)	Temp. °C	Elapsed Time, t (sec)	Influent Reading (cm)	Effluent Reading (cm)	Total Change (cm)	Inflow to Outflow Ratio	Hydraulic Head, h (cm)	k, Hydraulic Conductivity (cm/sec)	k_{20} corrected for temperature (cm/sec)
0	22.0	0	0.0	25.0	0.0	0.00	165.6	0	0
99	22.0	5940	0.4	23.8	0.8	0.33	164.0	1.43E-07	1.36E-07
219	24.0	7200	1.1	22.7	0.4	0.64	162.2	1.34E-07	1.25E-07
360	25.0	8460	2.0	21.6	0.2	0.82	160.2	1.28E-07	1.15E-07
490	25.0	7800	2.9	20.5	0.2	0.82	158.2	1.41E-07	1.25E-07
1432	22.0	56520	9.1	13.7	0.6	0.91	145.2	1.32E-07	1.22E-07
1595	23.0	9780	10.1	12.6	0.1	0.91	143.1	1.30E-07	1.22E-07
1848	25.5	15180	11.7	11.0	0.0	1.00	139.9	1.30E-07	1.18E-07
						(0.75-1.25)		Final Value	1.22E-07

$$k_{20} = \frac{(a_{in})(a_{out})L[\ln(h_{n-1}/h_n)]*R_T}{At(a_{in} + a_{out})}$$

Total Change = $(Eff_{n-1} - Eff_n) - (Inf_n - Inf_{n-1})$

"Hydraulic Head" incorporates the difference in head as well as the added driving head pressure.
"Total Change" is the difference between the Effluent change from t_0 to t_1 and the Influent change from t_0 to t_1.

Notate temperature to the nearest half a degree. The correction calculation averages the two consecutive readings.
k is multiplied by the temperature correction, R_T, which is the ratio of the viscosity of water at test temperature to the viscosity of water at 20° C. Temperature range may be between 19° and 25° for formula calculation.
"Final Value" is the average of 4 consecutive readings of which none are less than or greater than 25% of their average. (50% of average if $k < 1 \times 10^{-8}$)

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

STS PROJECT NO.: 73086

PROJECT: Malcolm Pirnie

DATE: 3/17/99

SUMMARY OF TEST RESULTS

SAMPLE NO.	SB-312D		
LOCATION	Detroit Coke		
CLASSIFICATION	Gray clayey silt, some sand, trace fine gravel. (Visual)		
		INITIAL	FINAL
DRY UNIT WEIGHT (pcf)		104.4	107.6
WATER CONTENT (%)		23.8	21.4
DIAMETER (cm)		7.17	7.12
LENGTH (cm)		6.92	6.81
HYDRAULIC GRADIENT (MAXIMUM)	23.9		
PERCENT SATURATION	101.3	(Percent saturation calculation is based on final measurements and an estimated specific gravity.)	
HYDRAULIC CONDUCTIVITY k (cm/sec)	9.1E-08		

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
Rising tailwater method in a triaxial permeameter
ASTM D 5084, Method C (EM-1110-2-1906 7)

Project Name: Malcolm Pirnie
Project No.: 73086
Project Location: Detroit Coke
Sample No.: SB-312D
Sample Location: 17'-19'

Sample Description: Gray clayey silt, some sand, trace fine gravel. (Visual)

Cell No.: 4

Date Sampled:
Date Received:

MOISTURE CONTENT	INITIAL	FINAL
Container No.	32	A101
Wet Sample & Tare (g)	736.30	227.36
Dry Sample & Tare (g)	614.00	202.73
Wt. Water (g)	122.30	24.63
Wt. Tare (g)	99.50	87.66
Wt. Dry Soil (g)	514.50	115.07
Water Content, **w** (%)	23.8	21.4

SATURATION DATA

Initial Cell Pressure (psi)	Final Cell Pressure (psi)	Initial PWP (psi)	Final PWP (psi)	B Value
			Final B value =	

SPECIMEN INFORMATION	INITIAL	FINAL
Avg. Diameter (cm)	7.17	7.12
Avg. Height, **L** (cm)	6.92	6.81
X-Section Area, **A** (cm^2)	40.388	39.793
Specimen wet wt. (g)	578.94	566.74
Specimen Dry wt., W_s (g)	467.75	466.82
Total Volume, **V** (cm^3)	279.56	270.83
Dry Unit Weight (lbs/ft^3)	104.4	107.6
G_s estimated (Y or N)?	Y	Gs est.
Specific Gravity, G_s	2.720	2.720
Volume Solids, V_s (cm^3)	172.31	171.97
Pore Volume (cm^3)	107.25	98.86
Void Ratio, **e**	0.622	0.575
Degree of Saturation	103.9	101.3

$$\text{Volume Solids} = \frac{W_s}{(G_s)(\text{Water Density})}$$

$$\text{Void Ratio} = \frac{V - V_s}{V_s}$$

$$\text{Degree of Saturation} = \frac{(w)(G_s)}{e}$$

COMMENTS:

NOTE:
Deaired tap water was used as liquid permeant.

Proj Name: Malcolm Pirnie
Proj No.: 73086
Sample: SB-312D

k (cm/sec)	Max i
10^{-3} to 10^{-4}	2
10^{-4} to 10^{-5}	5
10^{-5} to 10^{-6}	10
10^{-6} to 10^{-7}	20
less than 10^{-7}	30

Hydraulic Gradient, i, Guidlines as per ASTM D5084, section 8.5.1

TEST CONDITIONS

Influent Burette Area a_{in} (cm^2)	Effluent Burette Area a_{out} (cm^2)	# ascend as burette empties? (Y or N)
1.00	1.00	Y

Cell Pressure (psi)	Headwater Pressure (psi)	Tailwater Pressure (psi)	Driving Head (psi)	Hydraulic Gradient Max	Hydraulic Gradient Min
64.0	60.0	58.0	2.0	23.9	19.6

TEST DATA

Timer Reading (min.)	Temp. °C	Elapsed Time, t (sec)	Influent Reading (cm)	Effluent Reading (cm)	Total Change (cm)	Inflow to Outflow Ratio	Hydraulic Head, h (cm)	k, Hydraulic Conductivity (cm/sec)	k_{20} corrected for temperature (cm/sec)
0	22.0	0	0.0	25.0	0.0	0.00	165.6	0	0
99	22.0	5940	0.5	24.4	0.1	0.83	164.5	9.61E-08	9.16E-08
280	24.5	10860	1.4	23.3	0.2	0.82	162.5	9.65E-08	8.94E-08
490	25.0	12600	2.6	22.1	0.0	1.00	160.1	1.01E-07	9.05E-08
1432	22.0	56520	7.7	17.0	0.0	1.00	149.9	9.98E-08	9.19E-08
1595	23.0	9780	8.5	16.2	0.0	1.00	148.3	9.40E-08	8.86E-08
1936	25.5	20460	10.3	14.4	0.0	1.00	144.7	1.03E-07	9.31E-08
2875	22.0	56340	14.8	9.9	0.0	1.00	135.7	9.77E-08	8.94E-08
						(0.75-1.25)		Final Value	9.07E-08

$$k_{20} = \frac{(a_{in})(a_{out})L[\ln(h_{n-1}/h_n)]*R_T}{At(a_{in} + a_{out})}$$

Total Change = $(Eff_{n-1} - Eff_n) - (Inf_n - Inf_{n-1})$

"Hydraulic Head" incorporates the difference in head as well as the added driving head pressure.
"Total Change" is the difference between the Effluent change from t_0 to t_1 and the Influent change from t_0 to t_1.

Notate temperature to the nearest half a degree. The correction calculation averages the two consecutive readings.
k is multiplied by the temperature correction, R_T, which is the ratio of the viscosity of water at test temperature to the viscosity of water at 20° C. Temperature range may be between 19° and 25° for formula calculation.
"Final Value" is the average of 4 consecutive readings of which none are less than or greater than 25% of their average. (50% of average if $k < 1 \times 10^{-8}$)

MALCOLM PIRNIE — ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

1400 ABBOTT ROAD, SUITE 140
EAST LANSING, MI 48823
PHONE: 517-337-0111

Mail

SITE NAME: DETROIT COKE

PROJECT NO.: 2420 108 H71

SAMPLERS (SIGNATURE):

Date	Time	Matrix*	Cont.	GRAB	Sample I.D.	No. of Containers	Container Type** & Volume	Field Filtered (Yes or No)	Preservation Method	Analysis Required: Grain Size + Hydrometer	Analysis Required: Triaxial Perm	Remarks
2/99	—	S		X	SB-302D	1	SHELBY TUBE	—		X	X	
2/99	—	S		X	SB-312D (17'-19')	1	"	"	—	X	X	
2/99	—	S		X	SB-303D (10-12.5)	1	"	"	—	X	X	
2/99	—	S		X	SB-312D (15'-17')	1	"	"	—	X	X	
2/99	—	S		X	SB-306D (9.5'-12')	1	"	"	—	X	X	

Comments/Instructions to Lab:

Relinquished by: (signature) Amanda Lee — Date/Time — Received by:

Dispatched by: (signature) — Date/Time — Carrier:

Lab Task Order #: — Airbill Shipping#: — Received at lab by: — Date/Time — Logged in by: — Date/Time

* MATRIX: WATER (WTR), WASTEWATER (WW), SOIL (SOL), SLUDGE (SLU), AIR, OIL, HAZARDOUS WASTE (HW)

** CONTAINER TYPE: P = POLYETHYLENE; G = GLASS

Page _____ of _____

Ken Sweet / Chris Enaler

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

STS PROJECT NO.: 73086

PROJECT: Malcolm Pirnie

DATE: 3/18/99

SUMMARY OF TEST RESULTS

SAMPLE NO. SB-302D

LOCATION Detroit Coke

CLASSIFICATION Brown and black clayey silt, trace organics. (Visual)

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	103.0	108.0
WATER CONTENT (%)	24.5	21.6
DIAMETER (cm)	7.11	7.08
LENGTH (cm)	7.13	6.85

HYDRAULIC GRADIENT (MAXIMUM) 23.2

PERCENT SATURATION 103.4 (Percent saturation calculation is based on final measurements and an estimated specific gravity.)

HYDRAULIC CONDUCTIVITY k (cm/sec) 6.7E-07

STS Consultants, Ltd.

HYDRAULIC CONDUCTIVITY DETERMINATION
Rising tailwater method in a triaxial permeameter
ASTM D 5084, Method C (EM-1110-2-1906 7)

Project Name: Malcolm Pirnie
Project No.: 73086
Project Location: Detroit Coke
Sample No.: SB-302D
Sample Location:

Sample Description: Brown and black clayey silt, trace organics. (Visual)

Cell No.: 1

Date Sampled:
Date Received:

MOISTURE CONTENT	INITIAL	FINAL
Container No.	A12	A101
Wet Sample & Tare (g)	219.74	185.35
Dry Sample & Tare (g)	193.90	167.98
Wt. Water (g)	25.84	17.37
Wt. Tare (g)	88.30	87.66
Wt. Dry Soil (g)	105.60	80.32
Water Content, w (%)	24.5	21.6

SPECIMEN INFORMATION	INITIAL	FINAL
Avg. Diameter (cm)	7.11	7.08
Avg. Height, L (cm)	7.13	6.85
X-Section Area, A (cm^2)	39.659	39.369
Specimen wet wt. (g)	580.52	567.09
Specimen Dry wt., W_s (g)	466.39	466.26
Total Volume, V (cm^3)	282.57	269.48
Dry Unit Weight (lbs/ft^3)	103.0	108.0
G_s estimated (Y or N)?	Y	Gs est.
Specific Gravity, G_s	2.720	2.720
Volume Solids, V_s (cm^3)	171.81	171.76
Pore Volume (cm^3)	110.76	97.72
Void Ratio, e	0.645	0.569
Degree of Saturation	103.2	103.4

SATURATION DATA

Initial Cell Pressure (psi)	Final Cell Pressure (psi)	Initial PWP (psi)	Final PWP (psi)	B Value
			Final B value =	

COMMENTS:

NOTE:
Deaired tap water was used as liquid permeant.

$$\text{Volume Solids} = \frac{W_s}{(G_s)(\text{Water Density})}$$

$$\text{Void Ratio} = \frac{V - V_s}{V_s}$$

$$\text{Degree of Saturation} = \frac{(w)(G_s)}{e}$$

Proj Name: Malcolm Drive
Proj No.: 73086
Sample: SB-302D

TEST CONDITIONS

Influent Burette Area a_{in} (cm^2)	Effluent Burette Area a_{out} (cm^2)	# ascend as burette empties? (Y or N)
1.00	1.00	Y

Hydraulic Gradient, i, Guidlines as per ASTM D5084, section 8.5.1	
10^{-3} to 10^{-4}	2
10^{-4} to 10^{-5}	5
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Cell Pressure (psi)	Headwater Pressure (psi)	Tailwater Pressure (psi)	Driving Head (psi)	Hydraulic Gradient Max	Hydraulic Gradient Min
64.0	60.0	58.0	2.0	23.2	17.6

TEST DATA

Timer Reading (min.)	Temp. °C	Elapsed Time, t (sec)	Influent Reading (cm)	Effluent Reading (cm)	Total Change (cm)	Inflow to Outflow Ratio	Hydraulic Head, h (cm)	k, Hydraulic Conductivity (cm/sec)	k_{20} corrected for temperature (cm/sec)
0	22.0	0	0.0	25.0	0.0	0.00	165.6	0	0
37	22.0	2220	1.9	22.8	0.3	0.86	161.5	1.01E-06	9.67E-07
78	22.0	2460	3.8	20.7	0.2	0.90	157.5	9.16E-07	8.73E-07
122	22.5	2640	5.7	18.8	0.0	1.00	153.7	8.31E-07	7.87E-07
204	23.0	4920	9.0	15.5	0.0	1.00	147.1	8.01E-07	7.51E-07
320	25.0	6960	13.0	11.3	0.2	0.95	138.9	7.40E-07	6.73E-07
447	25.0	7620	17.0	7.2	0.1	0.98	130.8	7.08E-07	6.30E-07
537	25.0	5400	19.7	4.6	-0.1	1.04	125.5	6.88E-07	6.12E-07
						(0.75-1.25)		Final Value	6.66E-07

$$k_{20} = \frac{(a_{in})(a_{out})L_s[\ln(h_{n-1}/h_n)]*R_T}{At(a_{in} + a_{out})}$$

Total Change = $(Eff_{n-1} - Eff_n) - (Inf_n - Inf_{n-1})$

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